An analysis of the relationship between external debt, institutional quality and economic growth in sub-Saharan African countries

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DECLARATION

I declare that this thesis titled

Relationship between external debt, institutional quality and economic growth in sub-Saharan African countries

is my own work and that all the materials and resources which were quoted and used were duly acknowledged using in-text citations and complete references, and that I had not previously submitted the thesis for degree purposes at any other university

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Adewale Samuel Hassan

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DEDICATION

To the Almighty God.

ABSTRACT

The need to attain robust growth and sustainable development has led most sub-Saharan African (SSA) countries to adopt different policies and strategies at various stages of their development since independence. However, owing to distortions in the economic, financial and institutional arrangements in this region in the 1960s, recourse to external debt to galvanise the economies towards a path of sustainable development became the norm from the 1970s. Indeed, in the past few decades, the external debt stock of SSA countries has increased significantly, thus, making the debate on its sustainability and role in financing the development process of these countries particularly important. Moreover, beyond the issue of sustainability or otherwise of foreign borrowing and the controversy over its effect on growth, the impact of institutions in the borrowing countries has also come to the fore in recent years. Thus, this thesis investigated the relationship between external debt, institutional quality and economic growth in SSA countries. The overarching aim of the study was subsequently divided into primary, theoretical and empirical objectives.

To achieve the empirical objectives of the study, a quantitative research approach was adopted. Specifically, three major econometric models (one for each empirical objective) were estimated by means of panel autoregressive distributed lag (ARDL) technique. The first model examined the nonlinear effect of external debt on economic growth, while the second model investigated the channels of transmission between external debt and economic growth. The third model examined the role of institutional quality in the relationship between external debt and economic growth. Each model estimation was preceded by statistical tests: summary of descriptive statistics, correlation analysis and panel unit root tests. While both descriptive statistics and correlation analysis shed light on the various characteristics of the data, results from the panel unit root tests conducted showed that the variables employed in each of the models were of mixed stationarity, in which case some were stationary at level, while others became stationary, only at first difference. Furthermore, annual secondary data between 1985 and 2017 for thirty SSA countries were employed in the study. The data sets were obtained from different sources comprising the World Bank's WDI and WGI, the International Monetary Fund (IMF)'s WEO, the World Penny Table (version 9.1) and the ICRG) database.

Results from the panel ARDL regression for investigating the nonlinear effect of external debt on economic growth in SSA reported both long-run and short-run estimates. The long-run PMG estimates established that external debt exerts a nonlinear impact on economic growth in SSA over the study period. In particular, the relationship between the two variables was found to be hump-shaped, which indicates that external debt stock at moderate levels enhances economic growth before reaching a threshold, beyond which it begins to depress economic growth. This threshold was determined for different measures of external debt. On the other hand, the short run estimates established that external debt has no impact on economic growth in the short run. Moreover, these results were found to be robust to alternative measures of external debt.

Furthermore, a second set of models were estimated to establish the channels of transmission in the relationship between external debt and economic growth. Results from the PMG estimators affirmed private investment, public investment and total factor productivity as the channels through which the nonlinear effect of external debt is transmitted to economic growth. Furthermore, the PMG estimates confirmed that interest rate is a channel transmitting linear and positive effect from external debt to economic growth. On the other hand, the results established that savings is not a channel of transmission between the two variables.

The third model investigated the role of institutional quality in the relationship between external debt and economic growth. Results from the various regressions showed that while external debt exerts a negative effect on economic growth, institutional quality mitigates the adverse effect in countries with good institutions. Furthermore, the minimum level of institutional quality beyond which external debt becomes beneficial to economic growth was determined. The results of the sensitivity analysis conducted also showed that the estimates were robust to alternative measures of institutional quality.

The study concludes that SSA countries should drastically reduce their reliance on external debt in their quest to fund their developmental efforts, through efficient use of existing accumulated debt, deepening of tax base, implementation of export-led growth strategy, strict adherence to external debt thresholds and greater emphasis on aids. Further, it is suggested that monetary authorities in SSA should endeavour to stimulate private investment by reducing interest rate, while the government should enhance total factor productivity by providing enabling environment

and support for massive acquisition of productive equipment, investing in human capital and by stimulating international best-practice corporate governance. Lastly, the study concludes that there is urgent need for SSA countries to consciously pursue rapid improvement in governance infrastructure.

Keywords: External debt, institutional quality, economic growth, threshold, panel ARDL, pooled mean group, sub-Saharan Africa.

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LIST OF ACRONYMS AND ABBREVIATIONS

ADF	Augmented Dickey Fuller
AGOA	African Growth and Opportunity Act
ARDL	Autoregressive Distributed Lag
DFE	Dynamic Fixed Effect
E-HIPC	Enhanced HIPC initiative
ECT	Error Correction Term
FE	Fixed Effects
G8	Group of eight highly industrialized nations
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
GNI	Gross National Input
GFCF	Gross Fixed Capital Formation
HIPC	Highly Indebted Poor Countries initiative
ICRG	International Country and Risk Guide
IDA	International Development Association
IMF	International Monetary Fund
IPS	Im-Pesaran-Shin
KKZ	Kaufman-Kraay-Zoido-Lobatan
LDC	Less Developed Countries
LLC	Levin-Lin-Chu
MDGs	Millennium Development Goals
MDRI	Multilteral Debt Relief Initiative
MG	Mean Group
ODA	Official Development Assistance

OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
PMG	Pooled Mean Group
PNG	Private Nonguaranteed
PPG	Public and Publicly Guaranteed
PRSP	Poverty Reduction Strategy Paper
PRS	Political Risk Services
RE	Random Effects
RTA	Retroactive Terms Adjustment
SADC	Southern African Development Community
SDGs	Sustainable Development Goals
SDR	Special Drawing Rights
SPG	Stability and Growth Path
SSA	sub-Saharan Africa
STR	Smooth Transition Regression
TFP	Total Factor Productivity
VECM	Vector Error Correction Model
WAEMU	West African Economic and Monetary Union
WDI	World Development Indicators
WEO	World Economic Outlook
WGI	World Governance Indicators
XGS	Export of Goods and Services

CHAPTER 1

INTRODUCTION AND BACKGROUND

1. 1 INTRODUCTION AND BACKGROUND TO THE STUDY

The need to attain robust growth and sustainable development has led most sub-Saharan African (SSA) countries to adopt different policies and strategies at various stages of their development since attaining their independence. However, owing to distortions in the economic, financial and institutional arrangements in this region in the 1960s, recourse to external debt to galvanize the economies towards a path of sustainable development became the norm from the 1970s onwards (Ouedraogo, 2015:124). Over the past few decades, the external debt stock of sub-Saharan African countries has increased significantly, making the debate on its role in financing the development process of these countries particularly important (Drine & Nabi, 2010:487; World Bank, 2010:24, 2017:27).

Studies by Iyoha (1999:35), Loser (2004:13) and Ndikumana and Boyce (2011:150) document that from the 1980s, when the debt crisis involving several nations of the world occured, external debt in African economies had reached unsustainable levels, while they were simultaneously grappling with its concomitant negative macroeconomic effects. According to Akyuz (2007:5), unsustainable indebtedness occurs when an economy cannot fulfil its current and future debt commitments in full, without needing to reschedule the debt and/or adjust its balance of payments. The Heavily Indebted Poor Countries (HIPCs) initiative which the International Monetary Fund (IMF) and the World Bank inaugurated in 1996, was the first comprehensive campaign to terminate unsustainable debt and assist in a permanent exit from debt dependence among the poor economies of the world. Under this initiative, Western leaders agreed to write off large portions of several African nations' external debts. Currently, however, stocks of external debt have been increasing in most of these countries, following unbridled borrowing in recent years, coupled with the collapse in local currencies and commodity prices (World Bank, 2010:24; World Bank, 2017:27).

For instance, Ghana's external debt stock which stood at 139% of GNI in 2000 reduced to 69% of GNI in 2005, following the HIPC/E-HIPC initiatives. It further declined to 28.8% of GNI in 2010

after the Multilateral Debt Relief Initiative (MDRI) intervention. However, as at 2015, it had surged to 56% of GNI and was still growing (World Bank, 2017:77). Another noticeably big beneficiary of the debt forgiveness initiatives in SSA was Mozambique, which had its external debt slashed to 60% of GNI in 2005, - from 116% of GNI in 2000. It declined even further to 36% of GNI in 2011. But as at 2015, it had increased to 69.5% of GNI (World Bank, 2017:111). Similar trends can be observed for other SSA countries like Angola, Cameroon, Gabon, Senegal and Zambia. While grappling with this conundrum, they have equally been inundated with series of debt-rescheduling, which aggravated the debt crisis. In SSA, debt rescheduling dates back to the 1980s, and the total which stood at US$13.94billion in 1989 rose to US$22.63billion by 2000. It nevertheless declined to US$1.03billion by 2007, due to the debt forgiveness initiative (Muhanji & Ojah, 2011:184). At this point however, it needs to be stated that there is ample evidence in empirical literature that if procured sustainably and applied productively, foreign loans can be an ancillary to economic growth (Cassimon & Vaessen, 2007:24; Claessens & Diwan, 1990:29; Easterly, 2002:1692; Ferrarini, 2008:2549). Examples of countries that have employed debt productively for growth include South Korea, Chile, Brazil and Ghana (Muhanji & Ojah, 2011:184).

External debt described in the debt cycle hypothesis - advanced by Avramovic (1964:84), is considered crucial to stimulating investment in countries experiencing low savings. According to the abovementioned hypothesis, if managed properly, external debt would enhance domestic savings in the long run, which would consequently promote investment and pay back the foreign loans incurred earlier. However, it appears many SSA countries are still trapped in the earlier stage, as the stock of external debt keeps increasing, while they remain beset by low domestic savings (Drine & Nabi, 2010:489). Recently, the debt overhang hypothesis was added to pool of theories on debt. According to the hypothesis, external debt stock stimulates investment and economic growth, when held at moderate levels; however, it hampers investment and economic growth, once it exceeds a certain threshold (Claessens & Diwan, 1990:22; Cohen, 1995:1154; Krugman, 1988:255; Sachs, 1989:282).

Some of the benchmarks for measuring the sustainability or otherwise of external debt include the debt/GNI, debt/exports, interest payment on external debt service/exports and reserves/external debt ratios (World Bank, 2010:4). In light of this, Pattillo *et al.* (2002:19) show that external debt

stock becomes inimical to growth when it is held at a level where its ratio to GDP surpasses between 35% and 40%. Similar findings confirming the nonlinear impact of external debt on growth are also made by Clements *et al.* (2003:17), Cordella *et al.* (2005:19) and Manasse and Roubini (2009:202), at different thresholds. In contrast, however, Caliari (2006:9) disagrees with the use of the various debt ratios for measuring the sustainability or otherwise of external debt. Rather, he proposes that debt sustainability should be assessed based on the ability or otherwise of HIPCs to financially live up to their obligations to the MDGs (now SDGs) and other human development necessities.

Beyond the issue of sustainability or otherwise of foreign borrowing and the controversy over its effect on growth, the impact of institutions in the borrowing countries has come to the fore in recent years. Specifically, while analysing economic growth and governance nexus, differences in economic institutions have been found to explicate the discrepancies in growth among different economies, even though cultural and geographical factors are also essential (Acemoglu *et al.*, 2005:397; Acemoglu *et al.*, 2003:108; Acemoglu & Robinson, 2008:5; Qayyum *et al.*, 2014:47). Among the prudential standards adopted by the IMF, good governance appears to be the most critical, to help governments correct their debt management inadequacies and promote debt management transparency (Ouedraogo, 2015:124).

The quality of institutions has become an integral part of the study of economic development. According to Borrmann *et al.* (2006:346) and Acemoglu and Robinson (2008:2), institutions constitute the regulations guiding the conducts and activities of humans. In a similar vein, Udah and Ayara (2014:9) refer to institutions as the directives governing activities of economic agents in an economy. They further opine that the players are therefore expected to play in accordance to the rules of the game, while the existing institutions should provide the right enticements or rewards for the good players and mete out disciplinary measures to bad players. To Vitola and Senfelde (2015:272), institutions are both formal (state-order rules) and informal (private-order beliefs, norms, and conventions) restrictions that affect economic activities.

In a similar vein, North (1992:10) posits that improved institutional quality promotes economic development through a systematic transformation of the environment to becoming conducive to economic growth. In addition, studies by Calderon *et al.* (2012:5) and Adigozalov and Rahimov

(2015:4) maintain that economic growth depends largely on the presence and nature of institutions which protect property rights and individual freedoms, guarantee protection from external shocks, and provide room for a reasonable degree of policy experimentation. While controversies exist concerning the impact of external debt on growth, the quality of institutions, alongside clear development agendas, can pave the way for efficient utilisation of such funds, thereby contributing positively to the total output. South Korea and Taiwan are examples of economies which employed foreign loans, coupled with improved institutional infrastructure to improve their economies (Rodrik, 1998:12; Rodrik *et al.*, 2004:150).

1.2 PROBLEM STATEMENT

Over the years, the relationship between external debt and economic growth has remained a major issue widely discussed in the macroeconomic literature (Edet-Nkpubre, 2013:44). Predictably, it has generated heated macroeconomic debates between two major, but opposing schools of economic thought: The Keynesians and the neoclassical economists. The literature on the debt – economic growth nexus has been classified into three major strands by Oleksandr (2003:65). The first strand suggests that external debt negatively affects economic growth (Ali & Mustafa, 2012:15; Elbadawi *et al.*, 1997:57; Karagol, 2002:1106; Were, 2001:14). This strand corroborates the position of the neoclassical economists who equate debt to a future tax and focus on the negative effects of debt overload.

The second strand holds that external debt impacts economic growth positively (Amin & Audu, 2006:18; Baker & Hassan, 2008:42; Ogunlana, 2016:97; Pattillo *et al.*, 2004). Their position supports the stance of the Keynesians that an increase in public debt impacts growth positively and is necessary for economic recovery. The third strand, which combines the first two strands, involves the investigation of a nonlinear relationship between the two macroeconomic variables. A nonlinear relationship is said to be an association between two variables, if the nature or complexion of the relationship between them alters for different levels of either of them (particularly, the independent variable). The relationship is said to be linear, however, if the nature of the relation remains the same, regardless of the magnitude or level of the independent variable. In this strand, studies by Blavy (2006:21), Schclarek (2004:9) and Schclarek and Ramon-Ballester (2005:11) do not find evidence of a nonlinear relationship between external debt and economic

growth, while other studies, such as those by Adam and Bevan (2005:594), Cordella *et al.* (2005:19), Deshpande (1997:169) and Pattillo *et al.* (2002:19), claim that the nexus follows a nonlinear pattern. Hence, findings from studies on the existence or otherwise of nonlinearity in the external debt-economic growth relation have been inconclusive. To buttress this position, Daud and Podivinsky (2014:1179) posit that studies on the relationship between the two variables are far from being thorough or conclusive, especially for developing economies.

Meanwhile, only a few studies have examined the nonlinear effect of debt on growth for SSA countries, with most of the studies pooling just a handful of SSA countries with other developing countries from different regions of the world in panel studies (Caner *et al.*, 2010; Clements & Krolzig, 2003; Pattillo *et al.*, 2002; Pattillo *et al.*, 2011; Presbitero, 2010; Schclarek, 2004). Findings from such studies cannot be solely relied upon for SSA countries, since there is no consistent uniformity in the economic structures across regions. A few studies that focus solely on SSA include Elbadawi *et* al., (1997), Fosu (1996), Iyoha (1999) and Ouedraogo (2015). While findings from most of these studies indicate that the effect of external debt on growth is nonlinear, results from some more recent studies find no evidence that the relationship between the two variables follows a nonlinear pattern (Blavy, 2006:21; Kourtellos *et al.*, 2013:35; Pescatori *et al.*, 2014:14; Schclarek, 2004:9; Schclarek & Ramon-Ballester, 2005:11). This implies that the precise nature of the association between the two macroeconomic variables is still inconclusive; hence, the need to re-evaluate this relationship, using more encompassing and recent data for as many SSA countries as possible.

Furthermore, in the studies where external debt is found to exert a negative impact on economic growth, the identification of the precise transmission channel remains inconclusive. For instance, in a panel study comprising 61 developing countries, Pattillo *et al.* (2004:5) document that external debt accumulation transmits its negative effect to economic growth through the channel of physical capital accumulation and total factor productivity growth. According to the study, total factor productivity growth accounts for a large portion of the impact of debt on growth, while physical capital accumulation contributes to the remaining impacts. Another study by Riffat and Munir (2015:25-28) for four South Asian countries identifies the channels of transmission from debt to economic growth as private investment, public investment and total factor productivity. Moreover, Pattillo *et al*. (2011:24) suggest that investment is the main channel through which large debt

transmits negative impact into the economy. Furthermore, they also found some evidence for total factor productivity as a channel of transmission between the two variables. Despite there being very few studies on the channels of transmission in the external debt-growth nexus and that they are inconclusive concerning the precise channels, none of them focus predominantly on SSA countries. This study, therefore, attempts to identify the precise channels of transmission between external debt and economic growth in SSA countries. To the best of this researcher's knowledge, this had not been considered in previous studies.

While obtaining foreign loans by governments of SSA countries is usually aimed at orienting their economic policies towards robust economic growth and sustainable development, the policy makers in these countries are duty-bound to engender appropriate means of providing the right and conducive economic environment, conditions and, very importantly, institutions to achieve this. Rodrik (1998:11) asserts that countries experiencing the sharpest drops in GDP are those with divided societies and weak institutions. Furthermore, studies by Cordella *et al*. (2005:23) claim that findings on an external debt-economic growth nexus are inconclusive; this is indicative of variations in country-specific characteristics. Several studies have also emphasised the importance of governance and the quality of institutions in enhancing the growth of an economy (Chong & Zanforlin, 2001:13; Dawson, 1998:616; Decker & Lim, 2008:701; Feld & Kirchgassner, 2008:19; Gonzalez & Mendoza, 2002:6; North, 1992:10). Only a few studies differ in their conclusions on the relevance of institutions to economic growth. For example, studies like those by Dollar and Kraay (2002:25) and Glaeser *et al.* (2004:26) find no evidence that institutions promote economic growth.

Although a few studies have been undertaken on the link between external debt and economic growth for SSA, existing studies on the relationship between the two variables in SSA rarely pay attention to the role of institutional setting in this nexus. The only known exceptions in this regard are studies by Edet-Nkpubre (2013:44), Ouedraogo (2015:124) and Presbitero (2008:2). While these studies assess the role of governance and institutional quality in the relationship between external debt and economic growth in SSA, none of them proposes an optimal level of institutional quality required for external debt to enhance economic growth in SSA. This study therefore contributes to the strand of literature on this subject by identifying the potential institutional quality threshold in the relationship between external debt and economic growth for SSA countries.

1.3 OBJECTIVES

The objectives of the study were categorised in three sections: primary, theoretical and empirical objectives.

1.3.1 Primary Objective

The primary objective of the study was to examine the relationship between external debt, institutional quality and economic growth in sub-Saharan African countries.

1.3.2 Theoretical Objectives

In line with the primary objective, the following theoretical objectives were formulated for the study:

- To analyse the underlying thoughts on debt-growth nexus from theories of debt and economic growth;
- To analyse developments and trends surrounding external debt in SSA;
- To review existing empirical studies on the relationship between external debt, institutional quality and economic growth.

1.3.3 Empirical Objectives

In line with the primary objective of the study, the following empirical objectives were formulated:

- To investigate the nonlinear effect of external debt on economic growth in SSA countries;
- To determine the channels of transmission in the external debt-economic growth nexus in SSA countries;
- To investigate the role of institutional quality in the relationship between external debt and economic growth in SSA countries.

1.4 RESEARCH DESIGN AND METHODOLOGY

To achieve both the theoretical and empirical objectives of this study, a number of methods were employed, ranging from descriptive, statistical methods to a review of literature and an econometric analysis. To address the theoretical objectives, descriptive methods such as graphs and tables were employed to analyse the relationship between the variables under consideration and particularly, to appraise the profile of external debt in SSA. Furthermore, a review of literature was conducted from relevant sources. The literature employed which included textbooks, journal articles, working and discussion papers, government publications, dissertations and theses on the relationship between external debt, institutional quality and economic growth provided ample information on each of the variables as well as on the interrelationship among them. The review of literature began with theoretical literature, wherein relevant theories of external debt and economic growth were reviewed. In addition to this, theories that address the relation between the two macroeconomic variables were reviewed specifically: the classical growth theory; the Harrod-Domar growth model; the neoclassical growth model; the endogenous growth theory; the Keynesian theory; the debt overhang hypothesis and the debt Laffer curve. The examination of the theoretical literature was followed by a review of empirical literature, including: an appraisal of previous studies on the linear and nonlinear relationship between debt and economic growth; channels of transmission from external debt to economic growth; the relationship between institutional quality and economic growth as well as the role of institutional quality in external debt-economic growth nexus. All these were carried out with the aim of achieving the theoretical objectives of the study.

On the other hand, to achieve the empirical objectives of the study, an econometric method of data analysis was employed. In particular, the panel Autoregressive Distributed Lag (ARDL) technique proposed by Pesaran and Smith (1995) and Pesaran *et al*. (1999) was considered appropriate for this study, considering the relatively large number of years (T) and cross sections (N) involved in the study (Pesaran *et al.*, 1999:621), as well as the integration properties of the data. Furthermore, the technique is superior to the traditional cointegration techniques, as it possesses several econometric advantages in comparison to them. First, it enables the researcher to concurrently estimate both long-run and short-run parameters in a model. Second, it can be employed to examine the relationship between variables whether they are all stationary at level or at first

difference, or even if both categories of variables are contained in the model. Third, it avoids the problems of endogeneity. Fourth, it affords the exploration of the short-run relationship with the error correction term, which indicates the speed of adjustment, following initial divergence from equilibrium, by employing the ARDL-ECM framework. Lastly, it produces better results employing a small sample, compared to other cointegration procedures (Blackburne & Frank, 2007:205; Pesaran *et al.,* 1999:626).

1.4.1 Sample selection and study period

This study employed a panel data estimation technique which involves the combination of both cross section (N) and time series (T) observations for analysis. Panel data analysis is highly advantageous as it not only increases the total number of observations and their variations, but also reduces the disturbance from the individual time series, hence, heteroscedasticity is not a problem in panel data analysis. Moreover, it affords the model more degrees of freedom and provides greater sample variability, thereby enhancing the efficiency of parameter estimates (Greene, 2011:314). The focus of this study is the sub-Saharan African countries, but due to data availability limitations, a sample of 30 SSA countries (listed in Appendix 2), which cut across all the four sub-regions making up SSA, were employed for the analysis. Furthermore, the study captured a 33-year period between 1985 and 2017 (inclusive). The choice of 1985 as the starting period was informed by the fact that SSA experienced the beginning of an upsurge in external debt accumulation, as well as a massive slowdown in economic growth during the 1980s.

1.4.2 Nature of data

The study used annual secondary panel data of relevant variables from diverse sources to analyse the relationship between external debt, institutional quality and economic growth in SSA. Specifically, data on external debt, economic growth, population growth rate, human capital, investment and interest rate were sourced from the World Development Indicators (2018) of the World Bank, and data on total factor productivity were sourced from the World Penn Table, while those of the institutional quality were sourced from the International Country Risk Guide (ICRG) database of the Political Risk Services (PRS) group.

1.4.3 Model specification

In order to achieve the empirical objectives of this study, econometric models were estimated. For the first empirical objective of investigating the nonlinear effect of external debt on economic growth, the following dynamic panel model (1.1) was formulated:

$$LGDP_{it} = \alpha_{0i} + \alpha_{1i}LGDP_{i,t-1} + \alpha_{2i}ED_{it} + \alpha_{3i}ED_{it}^2 + \alpha_{4i}X_{it} + \mu_i + \varepsilon_{it} \quad (1.1)$$

where i and t are cross-sectional units and time period, respectively, $LGDP$ is log of real GDP per capita, representing economic growth, $LGDP_{i,t-1}$ is the lagged dependent variable to measure the extent of persistence in economic growth variable, ED is the external debt variable, denoting the level of external debt (comprising external debt as a percentage of GNI, external debt as a percentage of export, external debt interest payment as a percentage of export and total external debt stocks), X is a vector of control variables, α_{1i}, α_{2i}, α_{3i} and α_{14i} are the parameters to be estimated, μ_i is the individual country-specific effects to capture unobserved heterogeneities among countries, and ε_{it} is the error term.

The focus of the second objective is the identification of channels of transmission from external debt and economic growth. To achieve this objective, the following dynamic panel model (1.2) was formulated:

$$Z_{it} = \gamma_{0i} + \gamma_{1i}Z_{i,t-1} + \gamma_{2i}ED_{it} + \gamma_{3i}ED_{it}^2 + \gamma_{4i}X_{it} + \mu_i + \varepsilon_{it} \quad (1.2)$$

where i and t are cross-sectional units and time period, respectively, Z is the dependent variable, denoting the respective channel being examined, ED and ED^2 is the external debt variable and its squared term respectively, X is a vector of control variables which include inflation rate, economic growth and trade openness, $Z_{i,t-1}$ is the lagged dependent variable, μ_i is the country-specific effect, and ε the is error term.

Lastly, the third empirical objective concerns the role of institutional quality in the external debt-economic growth nexus; and to achieve this objective, the following dynamic panel model (1.3) was estimated:

$$LGDP_{it} = \theta_{0i} + \theta_{1i}LGDP_{i,t-1} + \theta_{2i}ED_{it} + \theta_{3i}(ED * IQ)_{it} + \theta_{4i}IQ_{it} + \theta_{5i}X_{it} + \mu_i + \varepsilon_{it} \quad (1.3)$$

where i and t are cross-sectional units and time period, respectively, $LGDP$ is log of real GDP per capita, ED is external debt as a percentage of GNI, IQ is an index of institutional quality, $(ED * IQ)$ is interaction term of external debt and institutional quality, X is a vector of control variables which include investment, human capital and trade openness, $LGDP_{i,t-1}$ is the lagged dependent variable, μ_i is the country-specific effect, and ε the is error term.

1.4.4 Data analysis

The collected data sets were analysed using specialised econometric software packages: E-VIEWS version 9 and STATA version 13. Three different pre-estimation statistical tests were conducted: descriptive statistics, correlation analysis and panel unit root tests. These statistical tests were preceded by a trend analysis of the three main variables in the study: external debt, institutional quality and economic growth. The econometric analysis started with the descriptive statistics of all the variables in each of the models, which provided a quantitative summary of each variable. This was followed by a correlation analysis with the aim of determining the degree of association among the variables in the models. Lastly, panel unit root tests were conducted to verify the unit root properties of the data set. Specifically, the panel unit root tests conducted comprised the Levin, *et al.* (2002), Im *et al.* (2003) and Fisher-type test, suggested by Maddala and Wu (1999). Based on the results of the panel unit root tests, the panel autoregressive distributed lag (ARDL) models were estimated in order to be able to investigate the relationship between external debt, institutional quality and economic growth in SSA countries.

1.5 SIGNIFICANCE AND CONTRIBUTION OF THE STUDY

Since the 1970s, foreign loan has formed an important source of funding developmental projects in SSA countries, and since then, the Bretton Woods institutions have granted a huge amount of concessional loans to these countries (Ouedraogo, 2015:124). Instead of these countries witnessing development as intended when obtaining these loans, many of them have found themselves in an unsustainable cycle of debt. In a bid to find a lasting solution to this debt conundrum, several research efforts have been made to shed light on the causes of this problem. A major finding in this regard lies in the proposition that external debt exerts a nonlinear impact on economic, in which case external debt is said to have positive effect on growth up to a particular threshold,

beyond which the effect becomes negative, while certain other research results differ from this conclusion (Daud and Podivinsky, 2014:1179).

Findings from the literature reveal that SSA has received very little attention in this regard, despite its importance, with Ouedraogo (2015) as the only known study that was entirely focused on a section of sub-Saharan Africa (West Africa), which cannot be taken as a robust representation of the entire SSA region. This study has therefore attempted to make a contribution by providing up-to-date information on the nonlinear effect of external debt on economic growth in SSA countries, as well as employing a more robust econometric technique. With this, SSA countries would have access to adequate information on the threshold of external debt (if relationship is found to be nonlinear), beyond which it begins to exert a negative effect on growth, and would thus be able to make the necessary adjustments in their policy decisions.

Another reason put forward for poor performance of external debt is the below-par condition of the institutions in these countries (Ouedraogo, 2015:124). Assessing the contingent effects of institutional quality in the relationship between external debt and economic growth, particularly the threshold of institutional quality in this relationship, could enable the SSA countries to determine the minimum quality required in their institutional settings to enhance the performance of their external debt stocks. To the best of the researcher's knowledge, this has not been previously investigated, especially in relation to SSA. In this study, this researcher therefore takes part in this stream of research by investigating the threshold of institutional quality in the relationship between external debt and economic growth in SSA countries.

1.6 ETHICAL CONSIDERATIONS

The researcher acknowledges his responsibility to conduct this study in accordance with the ethical standards of academic research, hence, the highest level of integrity was maintained at all times in the course of the study. As the study relied mainly on secondary sources of data which comprised the World Bank's Word Development Indicators and World Governance indicators, the IMF's World Economic Outlook, the ICRG database and the Penn World Table, version 9.1, all the data sources have been well referenced. Furthermore, the guidelines and procedures of the North-West University were adhered to, hence, all materials used in the study are textually referenced and included in the reference list. Approved Ethics clearance number: NWU-0109-19A4.

1.7 CHAPTER ORGANISATION

The study consists of six chapters:

Chapter 1 is a general introduction to the study. Sections detailing the background of the study, statement of the research problem, research objectives, as well as the significance of the study are presented and discussed.

Chapter 2 presents a detailed overview of political and economic background of SSA countries, as well as the issues surrounding external debt policy developments and regimes in the region.

Chapter 3 reviews both the theoretical and the empirical literatures that relate to the study. The various issues discussed in this chapter follow a chronological order. First, important economic growth and debt theories are discussed in a selective fashion. These are followed by a detailed review of contributions made by previous empirical studies on the relationship between external debt, institutional quality and economic growth.

Chapter 4 discusses the methodological framework employed in empirically investigating the relationship between external debt, institutional quality and economic growth in SSA countries. In particular, the discussions on the framework are made with respect to the research procedure followed in conducting data analysis. Furthermore, the chapter presents the details about the employed data, as well as their sources and measurements.

Chapter 5 presents the empirical estimations and interpretation of results for the study. This involves a trend analysis of the key variables in the study, as well as the pre-estimation tests such as descriptive statistics, correlation analysis and panel unit root tests for the variables in all our models. These are followed by the estimation of our models by means of panel ARDL, as well as the interpretation of same.

Chapter 6 concludes the study with the summary and conclusions of the whole thesis. It also highlights a set of policy recommendations arising from the study, while further stating the limitations of the study. Further, areas of opportunity for future research are pointed out, while the contributions of the thesis to the literature are also covered in the chapter.

CHAPTER 2

PROFILE OF SUB-SAHARAN AFRICA'S EXTERNAL DEBT

2.1 INTRODUCTION

This chapter focusses on developments and issues surrounding external debt in relation to institutions and economic growth in sub-Saharan Africa (SSA). It begins with an overview of external debt and economic outlook in the region. The external debt situation, vis-à-vis the various steps taken to ameliorate its burden on the region over many years is discussed. This is followed by a discussion of the evolution and trend of external debt in SSA. The subsequent section considers the structure and components of external debt, while the last section which examines the severity of the external debt burden in the region.

2.2 OVERVIEW OF SUB-SAHARAN AFRICA'S EXTERNAL DEBT AND ECONOMIC OUTLOOK

Prior to the 1970s, developing countries generally experienced high rates of economic growth, largely driven by domestic economic forces (Table 2.1). During this period, investment was stimulated in these countries with less recourse to external resources (Ouedraogo, 2015:124). From the 1970s, however, the developmental strategy of these countries took a different turn as they resorted to funds from foreign sources (World Bank, 1995:7). Much of the growth recorded during this decade was therefore debt-led as the majority of developing countries borrowed heavily from the international money and capital markets, leaving their current accounts in continual deficit. Ever since then, huge amounts of concessional loans have been disbursed to these countries by the Bretton Woods institutions (Freytag & Pehnelt, 2008:62; Ouedraogo, 2015:124).

Table 2.1: Real GDP growth (yearly averages), 1966-1995

	1966-1973	1974-1980	1981-1990	1991-1993	1994	1995
World total	5.1	3.4	3.2	1.2	2.9	2.8
Industrialsed countries	4.8	3.0	3.2	1.3	3.0	2.5
Developing countries	6.9	5.0	3.3	4.6	4.6	4.9
East Asia	7.9	6.8	7.6	8.7	9.3	9.2

	1966-1973	1974-1980	1981-1990	1991-1993	1994	1995
China	8.5	6.3	9.9	12.3	12.2	10.2
South Asia	3.7	4.0	5.7	3.2	4.7	5.5
Sub-Saharan Africa	4.7	3.4	1.7	0.6	2.2	3.8
Latin America & Car	6.4	4.8	1.7	3.2	3.9	0.9
M. East & North Africa	8.5	4.7	0.2	3.4	0.3	2.5

Source: Iyoha (1999)

For African countries in general, matters took a turn for the worse in the 1980s when the continent started experiencing massive deterioration in its socio-economic condition, occasioned by an acute slowdown in economic growth. Available data for SSA indicates that during this decade, per capita income, per capita private consumption and import volume all declined by 2.2%, 14.8% and 4.3% respectively, while the volume of export remained stagnant. Meanwhile, the average growth rates in these variables for low-income economies were positive, thereby indicating the peculiarity of SSA's economic downturn during the period (Table 2.2).

Table 2.2: Macroeconomic indicators for SSA and low-income economies

Indicator	SSA	Low-income economies
Growth of per capita GNP (%), 1980-1989	-2.2	2.3
Change of per capita private consumption (%), 1980-1990	-14.8	31.3
Growth of export volumes (annual %)	0.2	5.4
Growth of import volumes (annual %)	-4.3	2.8
Gross domestic savings as % of GDP, 1990	16	28
Gross domestic investment as % of GDP, 1990	19	31

Source: Iyoha (1999)

The deterioration of the socio-economic conditions in SSA during this period could be attributed to a combination of both domestic and external factors. The domestic forces are linked to an inadequate policy framework in the economy, massive reliance on export of primary commodities and technologically backward production base which resulted in inflation, unemployment and other macroeconomic problems. On the other hand, the external factors are connected to

decreasing terms of trade caused by low and consistently falling primary commodity prices and dwindling net capital flow, which culminated in a balance of payments deficit and accumulating stock of foreign loans (Boote & Thugge, 1997:18). Table 2.3 shows the growth in SSA's external debt since 1970, while the trend is depicted in Figure 2.1. The external debt stock, which stood at US$84 billion in 1980 had more than doubled to US$177 billion by 1990, and had risen to US$212.8 billion by 2000. This upward trajectory continued until 2015, when it reached US$416.3 billion (World Bank, 2017:33).

Table 2.3: Total external debt for SSA, 1970-2015

Year	External debt (US$ Billion)	Growth in external debt (%)
1970	8.3	-
1975	22.7	173.5
1980	84	270
1985	90	7.1
1990	177	96.7
1995	236.1	33.4
2000	212.8	-9.9
2005	234.7	10.3
2010	282.9	20.5
2011	312.7	10.5
2012	352.6	12.8
2013	377.6	7.1
2014	400.1	5.9
2015	416.3	4

Source: World Bank (1992, 2009, 2018)

A country's external debt has been described as the total debt owed to non-resident creditors and comprises public and publicly guaranteed debt, private nonguaranteed debt, use of the IMF credit and other short-term debts (World Bank, 2017:164). The crisis regarding external debt in developing countries became evident in 1982 when Mexico defaulted on its debt obligations and declared that it could no longer fulfil its debt commitments (Fishlow, 1985:6; Freytag & Pehnelt, 2008:62; Iyoha, 1999:9). Since then, external debt and its servicing have moved to the fore in the

economic discourse in what has come to be known as the 'debt crisis' debate (Martin, 2004:12). With the accumulation of external debt, coupled with deteriorating economic conditions in SSA countries, the region also found itself in a conundrum concerning its unsustainable external debt in the 1980s. Since then, the external debt crisis has remained a recurrent problem in SSA; so much so that its occurrence in the region has become more pronounced than in other regions of developing countries (ILO, 1995:3; Iyoha, 1999:5; World Bank, 1992:23).

Even in relation to other African countries, North Africa (including the Middle East) recorded merely minuscule increases in its external debt stock over the past three decades, whereas, in the case of SSA, the figures have been high, with mounting debt servicing costs (World Bank, 2017:31). Net transfers on debt also declined substantially for the North African countries over the past three decades, indicative of the fact that their debt service payments exceeded fresh loan disbursements. Conversely, SSA recorded an improvement in net transfers on debt over the same period, especially in the 1990s (World Bank, 2010: 42; 2017:31). However, this cannot be interpreted as implying larger resource inflow; rather, it conceals the difficulty facing the region in servicing its debts, with arrears increasing over the period. This is of such concern that international policy research analysts seem to agree that highly indebted SSA countries would find it very hard, or even impossible to achieve satisfactory recovery of growth in investment and output if they continue to bear huge debt servicing burdens that necessitate a fairly large net transfer of funds abroad (Clements *et al*., 2005).

This critical debt situation in SSA and other heavily indebted economies has severally elicited decisive actions at the global level (Freytag & Pehnelt, 2008:62; Ouedraogo, 2015:124). These interventions are much more robust than the existing debt relief initiatives taken before the debt crisis, such as the Pearson Report of 1969 and the Retroactive Terms Adjustment (RTA) programme of 1978 (Freytag & Pehnelt, 2008:62). In the 1980s, debt restructuring initiatives like the Baker Plan and the Brady Plan were introduced in response to the debt crisis in the developing countries (Arslanalp & Henry, 2005:1017; Pettifor & Greenhill, 2002:1). However, most of these programmes merely succeeded in bailing out the lenders through debt rescheduling and conversion or selling them to international financial institutions. In the case of the Brady Plan, it was not aimed at the critical debt problem of the heavily indebted poor countries (HIPCs), rather, it was directed towards mitigating the debt overhang problem in middle-income economies, and according to

Arslanalp and Henry (2005:1017), that purpose was achieved by the initiative. Furthermore, Pettifor and Greenhill (2002:1) assert that the primary objective of the initiatives of the 1980s was the prevention of financial crisis in the West. Hence, the debt restructuring initiatives of the 1980s were inadequate to ameliorate the debt crisis in SSA.

The decisions at the 1988 Toronto and Trinidad summits of the G7, as well as the 1991 Paris Club-instituted Enhanced Toronto Terms, also known as the London Terms, certainly set the stage for a new approach to solving the debt burden problem of developing countries, especially that of the HIPCs (Addison & Rahman, 2004:113). Agreements were reached for the first time for the introduction of debt stock and debt service reductions into debt renegotiation, while other bilateral creditors took unilateral initiatives towards reducing debts related to their Official Development Assistance (ODA) programmes (Addison & Rahman, 2004:117; Paris Club, 2006a:43). In addition, the World Bank offered the HIPCs a series of debt relief options: the International Development Association (IDA) Debt Reduction Facility and exceptional IDA allocations. These was aimed at enabling several African countries to repay their commercial debt arrears or arrears owed to the World Bank itself (Paris Club, 2006b:21). However, the scope of coverage was limited, as certain classes of loans and countries were not covered in the agreement. For instance, while they consented to cutting non-ODA debts by half, no reduction was agreed for ODA debts. Furthermore, debts owed to multilateral institutions were not covered in the agreements, implying that HIPCs continued to transfer funds obtained from the bilateral creditors to them with the direct effect being a lack of improvement in liquidity (Freytag & Pehnelt, 2008:63; IMF/IDA, 2006:51; Paris Club, 2006a:45; Paris Club, 2006b:29).

Despite these ground-breaking initiatives by the G7, the Paris Club and the World Bank, the conundrum surrounding the debt situation of the HIPCs remained unresolved up until the mid-1990s. Rather than recording a reduction in their debt profile, many developing countries, especially the SSA countries, continued to experience a dramatic rise in their debt stock, even as they continuously found it difficult meeting their debt obligations (Boote & Thugge, 1997:18; Freytag & Pehnelt, 2008:63; Iyoha, 1999:11). This situation has been attributed to several factors by Boote and Thugge (1997:18), which include exogenous shocks, civil conflict, lack of sustained adjustment, creditors' improper lending behaviour and imprudent debt management in debtor countries. It was also observed that various efforts by the African countries to enhance their

external competitiveness were inadequate in tackling their debt crisis. Hence, it was noted that an effective solution to the debt crisis facing African countries required, amongst other policy orientations, specific commitments by both debtors and creditors (Bulow & Rogoff, 2005:394; Devarajan *et al*., 1999:18).

Following these developments, the first major response by the international community towards ameliorating the difficulties faced by the debtor countries, known as the HIPC initiative, were set in motion by the IMF and the World Bank in 1996. The main target of the programme was to reduce debt burdens to a sustainable level, stated to be debt/export and debt service/export ratios of between 200-250% and 20-25%, respectively (World Bank & IMF, 1996:49). Some of the eligibility criteria set out in the initiative included accumulated debt stock that had become unsustainable and having a good record of reforms through IMF- and IDA-supported programmes. To underscore the enormity of SSA's debt crisis, thirty-four SSA countries qualified for support from the HIPC initiative, thereby indicating that most of the World's HIPCs come from SSA (Freytag & Pehnelt, 2008:62). However, the main requirements for countries to become eligible for the scheme were later adjusted in 1999, following observed low success rates of the initiative. The revised scheme came to be known as the Enhanced HIPC (E-HIPC) initiative. Under the E-HIPC, the main aim was broadened to encompass economic development and reduction of poverty, thereby requiring each country applying for the scheme to have a Poverty Reduction Strategy Paper (PRSP) for implementation, which had to be consented to by both the IMF and the World Bank (Addison & Rahman, 2004:114; Paris Club, 2006b:27).

The HIPC and E-HIPC initiatives can be said to have been relatively successful because following their implementation, the debt owed by HIPCs debt obligations to official creditors declined from 70% of GDP in 1994 to 30% of GDP by 2005 (World Bank, 2009:141). However, despite this appreciable progress, HIPCs' debt owed to multilateral institutions still remained on the high side, as high as 60% of GDP in 2005. This moved the Organization for Economic Co-operation and Development (OECD) and Paris Club members to start demanding greater contributions from the multilateral institutions (Paris Club, 2006b:26). Consequently, a new debt relief scheme with the primary objective of comprehensive reduction of multilateral debt was proposed by the G8 in 2005 (Paris Club, 2006a:44). This scheme, referred to as the Multilateral Debt Relief Initiative (MDRI) was first implemented by the IMF and African Development Bank (AfDB) in January 2006, with

other international financial institutions and donor countries following suit (Freytag & Pehnelt, 2008:63; Paris Club, 2006a:44). Available data shows that the effect of the implementation of MDRI on the debt structure of SSA was impressive. As presented in Table 2.6, after 2005, the ratio of debt and debt service to export and GNI decreased rapidly, thereby prompting the expectation that the region had finally emerged and was getting on its feet regarding the long awaited path of sustainable development.

2.3 EVOLUTION AND TREND OF EXTERNAL DEBT IN SSA

The external debt crisis of SSA erupted in the 1980s during the global debt crisis, which was prompted by Mexico's declaration of inability to honour its debt obligations in 1982 (Freytag & Pehnelt, 2008:62; Iyoha, 1999:9). According to Iyoha (1999:9), a series of causative events at the global level could be attributed to the global debt crisis of the 1980s. First amongst them was the oil price shock of 1973 which left most non-oil producing developing countries with current account deficits, consequent upon which the countries turned to foreign borrowing with a view to mitigating their balance of payments difficulties. During the same period, the international commercial banks were desperate to recycle the excess liquidity at their disposal, which itself was a fallout from the global oil price hike. This, therefore, led to a situation of over-borrowing mostly by less developed countries as well as that of heedless lending by the international financial institutions in the 1970s (Addison & Rahman, 2004:112).

Economically speaking, things seemed to be going well for some years during which the debts were simply being rolled over upon maturity until the upheaval of the international economic crisis of 1982, which was occasioned by the crash in oil prices and surging rates of interest (Goodfriend & Robert, 2005:986). This was also accompanied by a general crash in world commodity prices, which was the mainstay of most developing economies. Consequently, the creditors could no longer roll over debts for developing countries, as they now needed to either reduce their imports or increase their exports to be able to service their debts in the face of worsening world trade conditions (Urquhart & Hewson, 1983:17). Furthermore, the international financial institutions also had their financial positions dangerously compromised in the process, which forestalled their ability to assist the indebted countries with mitigating measures, as they themselves had to struggle to maintain their financially viability (Iyoha, 1999:10). This marked the genesis of the global debt

crisis, which also affected the SSA countries in no small measure. The crisis was so pronounced in SSA that out of 45 countries in the region, 33 were in arrears and had already engaged in debt rescheduling as at 1987 (Greene, 1989:841).

Following the crisis, the external debt stock of SSA rallied upwards, in addition to the initial build-up of the 1970s. Before the 1970s, SSA's stock of foreign debt was much lower up to the early 1970s. The trend, however, changed over time as their stock of external debt grew in leaps and bounds especially in the 1970s. Table 2.3 records data on the trend of external debt in SSA, while Figure 2.1 provide graphical illustrations. The external debt stock, which was a mere US$8.3 billion in 1970 had increased to US$84 billion in 1980, indicating a 912% growth rate within a decade. Following the global debt crisis, the region witnessed another round of massive build-up of their external debt stock which rallied to US$236.1 billion in 1995, indicating that external debt stock in SSA grew by about 181% over the fifteen-year period.

The post-global debt crisis external debt stock's rapid increase could be traced to a number of economic factors which included continued deterioration of terms of trade and export earnings, higher rates of interest, as well as debt rescheduling and refinancing, which only culminated in higher external debt figures for the region (Boote & Thugge, 1997:18; Iyoha, 1999:11). With the intervention of the IMF and the World Bank aimed at reducing the level of indebtedness of heavily indebted countries in 1996 through the introduction of the HIPC initiative, thirty-four SSA countries qualified for support by the initiative. Consequent upon its implementation, the external debt stock of the region had reduced to US$212.8 billion by 2000, indicating that it declined by 9.9% between 1995 and 2000 (see Table 2.3). Following this reprieve, the external debt stock of SSA again started rising, and by 2005, it had surged to US$234.7 billion, indicating a growth rate of 10.3% from 2000 to 2005 (see Table 2.3).This renewed increase in external debt levels could be attributed to non-inclusion of debts owed to multilateral institutions in the HIPC and E-HIPC deals. Although, this class of debt was taken care of through the MDRI that was first implemented in 2006, it only recorded positive effects on the ratios of debt and debt service to export and GNI, which declined between 2005 and 2015 (see Table 2.6). Its effect was not felt on the total external debt stock which continued on the upward trend till it reached US$416.3 billion in 2015 (see Table 2.3 and Figure 2.1). This could also be attributed to renewed increase in foreign borrowing by SSA

countries following the negative impact of the 2007/2008 global financial crisis on investment and growth in developing countries, especially in SSA.

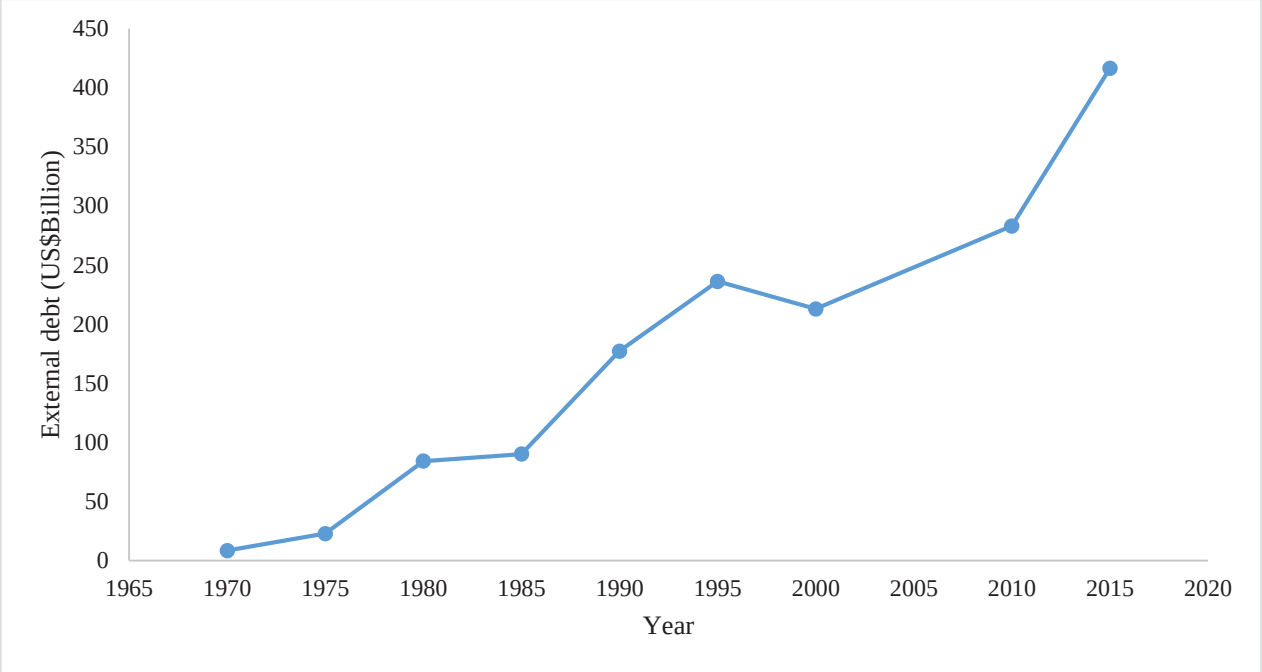

Figure 2.1: Total external debt

Source: Author's computation

2.4 STRUCTURE OF EXTERNAL DEBT IN SSA

In debt analysis, the composition of the stock of external debt is very important for consideration because of its decisive impact on the processes of debt repayment, rescheduling and relief. According to the World Bank (2017:163), the stock of external debt comprises three main components which are short-term debt, long-term debt and use of IMF credit. While short-term debts are external debts with original maturity not more than one year, IMF credit are those obtained from the IMF, especially in relation to the IMF special drawing rights (SDR). The long-term debt normally has an original maturity of more than one year and is broadly divided into two: private nonguaranteed (PNG) debt and public and publicly guaranteed (PPG) debt. PNG debt consists of external debt stock held by private debtors which are not guaranteed for repayment by a public entity in the debtor country. On the other hand, PPG debt comprises external debt held by the government and its agencies as well as those held by private agencies that are guaranteed for

repayment by a public entity. This is further sub-divided into official and private debts (World Bank, 2017:163).

Over time, the long-term debt has been the dominant component of SSA's total external debt stock. Table 2.4 shows the data on the composition of the total external debt for SSA. It stood at US$58.4 billion as at 1980, constituting 69.5% of the total figures. Next was the short-term debt, which amounted to US$22.6 billion, that is, 26.9% of the total debt, while the remaining 3.6% was the IMF credit. During the 1980s, the long-term debt of the SSA increased by 21.64% to US$149.29 billion in 1990. This constitutes 84.54% of the total external debt figures, to the detriment of short-term debt which plunged by 56.4% to constitute only 11.72% of the total debt by 1990, while the IMF credit grew marginally to 3.74% of the total figures. However, despite an appreciable growth of 33.7% in SSA's total external debt stock between 1990 and 1995, its long-term debt component reduced to 79%, with the short-term debt increasing to 17%, while IMF credit reverted to 3.66%. This interchange between long-term debt and short-term debt has continued ever since, with the long-term debt still remaining by far the largest component of SSA's total external debt.

Table 2.4: Composition of SSA's external debt

		Long-term debt				Short-term debt		Use of IMF credit	
Year	**Total EDT**	**PPG**	**PNG**	**Total Amount**	**% of EDT**	**Total Amount**	**% of EDT**	**Total Amount**	**% of EDT**
1980	84	53.8	4.6	58.4	69.5	22.6	26.9	3	3.6
1990	176.59	144.03	5.26	149.29	84.54	20.69	11.72	6.61	3.74
1995	236.07	175.15	11.76	186.91	79.18	40.5	17.16	8.65	3.66
2000	212.8	162.2	10.7	172.9	81.25	31.2	14.66	8.7	4.09
2005	234.7	174.9	17.6	192.5	82.02	34.1	14.53	8.1	3.45
2010	282.9	159.5	60.5	220	77.77	43.4	15.34	19.5	6.89
2015	416.3	260.8	81.2	342	82.15	54.9	13.19	19.4	4.66

Source: World Bank (1992, 2009, 2018)

Another important classification worthy of analysis is that of public and publicly guaranteed (PPG) debt, which constitutes a disproportionately larger part of SSA's long-term debt. This is because its classification into official and private debts has far reaching implications for issues bordering on financial access, as well as debt repayment and relief. It also has direct consequences for debtor

countries that require debt restructuring because of debt repayment problems. Official debts are debts owed to multilateral and bilateral creditors. On the other hand, private debt constitutes debts owed to foreign commercial banks, bond-holders and other private creditors. Multilateral creditors include international financial institutions (e.g. the World Bank), regional development banks (e.g. AfDB) and other multilateral and intergovernmental agencies. Their credits are usually provided on a multilateral basis. Bilateral creditors basically include governments and their agencies whose credits (or grants) are usually administered by an international financial institution on behalf of a single donor country. As presented in Table 2.5, a much larger share of the long-term debts of SSA are official debts. In 1990, it constituted 75.3%, increasing all the way to 83.8% in 2000. During the same period, its private debt counterpart plunged to 16.2%. However, the trend assumed the opposite direction thereafter, as the official debt component declined massively to 66.7% in 2010, while private debt climbed appreciably to 33.3%. The implication of this is that the official-private debt ratio which had reached 5:1 as at 2000 had plummeted to approximately 1.3:1 by 2010. The slide in official debt in favour of private debt continued further, even up until 2015, when official debt could muster just 58.2% of the PPG debt, while private debt had moved up to 41.8%.

Table 2.5: Official and private debts for SSA

		Official debt		Private debt	
Year	**Total PPG**	**Amount**	**% of PPG**	**Amount**	**% of PPG**
1990	144	108.4	75.3	35.6	24.7
1995	175	138.6	79.2	36.4	20.8
2000	162.2	135.9	83.8	26.3	16.2
2005	175	135.6	77.5	39.4	22.5
2010	159.5	106.4	66.7	53.1	33.3
2015	260.8	151.9	58.2	108.9	41.8

Source: World Bank (1992, 2009, 2018)

2.5 SEVERITY OF EXTERNAL DEBT BURDEN IN SSA

The extent of the external debt burden in SSA may best be appreciated by analysing the region's debt indicators or debt ratios, which are otherwise known as measures of debt burden. These ratios primarily measure two major indicators of the debt burden: the level of indebtedness and the debt

repayment burden. The debt-export ratio (EXT/XGS), which is the ratio of total external debt to export of goods and services and the debt-GNI ratio (EXT/GNI), which is the ratio of total external debt to gross national input both measure the level of indebtedness. On the other hand, the debt service ratio (TDS/XGS), which is the ratio of debt service payments to export of goods and services measures the debt repayment burden.

As reported in Table 2.6, the ratio of external debt to GNI increased from 50.1% to 76.2% between 1985 and 1995, representing a 50% increase within the ten-year period. The sharp increase of this ratio was connected to the decline in GNI witnessed by SSA economies, coupled with external debt levels growing faster than the GNI during the same period. The severity of the debt burden in SSA over this period becomes obtrusive when its EXT/GNI ratio is juxtaposed with those of other regions within the developing economies bracket. Data from Table 2.6 indicate that three out of the remaining five regions actually recorded significant reduction in their level of indebtedness over the ten-year period, with Latin America and the Caribbean reducing their level of indebtedness by a staggering 66.8%. Europe and Central Asia and the Middle East and North Africa also had theirs reduced by 37.8% and 17.9% respectively. Even the remaining two, whose indebtedness increased, recorded lower growth rates; that is, East Asia and Pacific and South Asia with 22.8% and 45% respectively. This is besides the fact that SSA held by far the highest EXT/GNI ratio compared to the remaining regions, especially between 1990 and 1995. For example, while the EXT/GNI ratio for SSA in 1995 was 76.2%, the average for the remaining five regions was 37.8%.

Owing to several debt relief schemes at the global level such as the HIPC, E-HIPC and MDRI, the level of indebtedness of SSA started declining from 1995, and by 2000, its EDT/GNI ratio had declined by 22%. The decline continued until 2010, when the ratio had plummeted to an impressive 22.4%. Despite this commendable progress, SSA's EDT/GNI ratio still remained one of the very highest amongst the developing regions as at 2010. Beyond 2010, the ratio again assumed an upward trend, and by 2015, it had surged to 28%, representing a growth rate of 25%. As presented in the Table, the EDT/XGS for SSA tells a similar story, although slightly less serious, over the period.

Table 2.6: Debt indicators (regional comparison), 1985-2015

Debt Indicator	Region	1985	1990	1995	2000	2005	2010	2015
EDT/GNI (%)	SSA	50.1	63	76.2	62.7	37.5	22.4	28
	East Asia & Pacific	28.9	35.5	35.5	29.2	20.9	10.3	17.5
	Latin America & the Caribbean	58.7	40.2	35.2	36.7	28.7	23	36.1
	Middle East & North Africa	63.1	56.8	53.5	38.2	25.9	14.9	16.3
	South Asia	22.2	31.6	32.2	26	18	19.7	23.9
	Europe & Central Asia	44.8	13	32.5	51.6	37.6	42.5	51.4
EDT/XGS (%)	SSA	226.6	222.8	254.7	186.2	98	70.2	116
	East Asia & Pacific	133.6	132.2	109.1	93.2	49.5	31.5	62.5
	Latin America & the Caribbean	309.5	231.8	198.5	178.5	117	117.3	169.4
	Middle East & North Africa	196.3	147.7	148.3	122.9	72.8	51.1	69.5
	South Asia	236.4	307.2	214.5	182.8	93.4	96.3	119.7
	Europe & Central Asia	146.8		117.7	143.7	105.4	127.5	147.5
DS/XGS (%)	SSA	25.2	13.7	15.9	11.9	9	3.8	7.7
	East Asia & Pacific	22.5	17.6	12.7	13.6	6.6	4.4	6.4
	Latin America & the Caribbean	38.2	21.9	25.4	40.5	24	14.9	23.3
	Middle East & North Africa	24.4	20.6	19.7	14.5	10.2	5.2	6.6
	South Asia	18	27.4	25.6	17.2	13.7	7.4	10.8
	Europe & Central Asia	22.5		10.6	19	20.2	22	24.8

Source: World Bank (1992, 2009, 2018)

Note: EDT/GNI=Ratio of total external debt to gross national input; EDT/XGS=Ratio of total external debt to export of goods and services; DS/XGS=Ratio of debt service payments to export of goods and services

Turning to the repayment burden, measured by TDS/XGS ratio, the table shows that the ratio declined by 84% between 1985 and 1990 from 25.2% to 13.7%, but increased again to 15.9% in 1995, indicating an increase of 16%. From 1995, the ratio declined continuously till it reached 3.8% in 2010. However, beyond 2010, the ratio assumed an upward trend such that by 2015, it had reached 7.7%, growing by 103% compared to the 2010 figure. Compared to other developing regions, the region fared better in terms of the ratio's rates and absolute figures. However, the encouraging figures posted by the ratio should be read with caution, as the decline in debt service

payments could have undesirable implications. This is because the difference in the actual debt service payments by several poor and heavily indebted SSA economies, compared with the scheduled payments, are often very high (Iyoha, 1999:15).

2.6 CONCLUSION

This chapter has profiled the external debt of sub-Saharan African countries from the 1960s to date. An analysis of the trend of external debt in SSA showed that its stock in the region has risen massively over the years, with economic growth contemporaneously declining during the period, despite several interventions at the global level to reverse this trend. Furthermore, the assessment in the chapter established that long-term external debt has been the dominant component of SSA's external debt stock, with public and publicly guaranteed debt taking a disproportionately large part of it. Lastly, an evaluation of the severity of external debt in SSA shows that SSA performed poorly compared to other developing regions of the world with respect to the relevant debt ratios.

In the next chapter, this study reviews both the theoretical and empirical literatures that pertain to the relationship between external debt, institutional quality and economic growth in both developed and developing countries, while paying special attention to SSA countries.

CHAPTER 3

LITERATURE REVIEW

3.1 INTRODUCTION

This chapter presents a survey of both the theoretical and empirical literatures that are relevant to the study of the relationship between external debt, institutional quality and economic growth. Specifically, it discusses certain issues associated with the impact of debt on economic growth which includes the varying patterns of the link between debt and growth from the perspectives of the classical, neoclassical, Keynesian and endogenous growth models. Others include the debt overhang hypothesis and the debt Laffer curve. Furthermore, a review of the existing empirical studies is conducted to shed light on the nature of the link between debt and growth, institutional quality and growth, as well as the role of institutional factors in the relationship between external debt and economic growth.

3.2 THEORETICAL LITERATURE

The relationship between external debt and economic growth is an important subject that has been accorded substantial attention in the theoretical literature. Several growth theories have analysed the relationship between the two macroeconomic variables from various positions. These growth theories include the classical growth theory, the Harrod-Dormar model, the Keynesian theory, the neoclassical growth theory and the endogenous growth theory. Other theories that discuss the debt-growth nexus include the debt overhang hypothesis and the debt Laffer curve. The theories are hereby successively discussed.

3.2.1 The classical growth theory

The classical growth theory is said to originate from the works of foremost classical economists of the eighteenth and nineteenth centuries, namely Adam Smith, David Ricardo, Karl Marx and J. S. Mill. This theory is presumed to be a supply-side driven growth model; it stresses the importance of investment growth and population growth, as well as an increase in overall productivity in propelling the growth of output of the economy. Essentially, with the aid of supply-side theories, the classical economists underscore the need to provide incentives to boost savings, which should

in turn, enhance investment as a way of stimulating the growth of the economy. This theory also claims that an increase in productivity can be achieved through division of labour and specialisation which could yield greater efficiency in production. The process, according to this theory, is capable of generating gains that would ultimately enhance savings, which would subsequently translate into additional investment and higher growth.

As far as the views of Adam Smith are concerned, the process of stimulating growth is strictly endogenous; hence, he concentrated on analysing the determinants of labour productivity growth, thereby underscoring the role of capital accumulation in enhancing the productivity of labour (Lowe, 1954:108-113). He argued that the main variable influencing labour productivity growth was the division of labour which is affected by the level of the market and consequently, capital accumulation. He also assumed a self-reinforcing growth in the form of increasing returns to scale, as savings creates investment, which in turn leads to growth. He held that this increasing returns to scale is largely external to firms in line with the classical hypothesis of a uniform rate of profit. In his analysis, he also suggested the concepts of induced and embodied technical progress, that is, learning by doing and learning by using, in which case workers are deemed responsible for inventing and improving new and old machines respectively.

As regards factors which could potentially slow down the rate of growth, Smith identified an insufficient supply of work force and diminishing returns that could set in as a result of scarcity of natural resources. He, however, brushed these factors aside by claiming that the process of capital accumulation is so seamless that by itself, it generates the additional workers that the process requires. He painted the scenario of a competitive environment in which the labour force is a commodity and that its quantity is competitively determined by level of effective demand for it. He also dismissed the possibility of diminishing returns by arguing that it would be prevented by an increase in productivity that would be engendered by division of labour. Therefore, as far as Adam Smith was concerned, there were no obvious limits to growth (Smith, 1776:83).

While Ricardo (1951:79) supported much of Smith's submissions, he concentrated a great deal of his efforts on correcting those aspects of Smith's analysis that he deemed wrong. In Ricardo's analysis, no prominent role is ascribed to division of labour vis-à-vis its effects on capital accumulation and productivity. He also argued that contrary to Smith's claim, diminishing return

does indeed constitute a limitation to growth. Ricardo, opposed to Smith's assertion, further argued that competition, with regard to capital, cannot lead to a decline in the rate of profit, in light of the real wage rate, but that a decline in the rate of profit can only be caused by diminishing returns, resulting from the fact that land is a scarce resource (Ricardo, 1951:81). Furthermore, Smith's argument of a long-term trend of profitability in the face of capital accumulation also takes a hit in his analysis. This is predicated upon the implicit assumption in Ricardo's theory that the set of production methods available to cost-minimising firms, is given and constant, in which case the main factor determining profitability remains the scarce natural resources, while capital accumulates - Ricardo refers to this process as the 'natural course' of events. He further explains the assumption of given and constant real wage rate means that the profit rate will slow down in the face of population growth and capital accumulation, because the production rate will naturally decline as more capital is employed on limited land or natural resources, which continue to suffer from diminishing returns.

However, Ricardo does agree with Smith on the fact that saving and investment, which make up capital accumulation would come mainly from profit, while wages and rents play very minor roles in the growth process. They therefore agreed that in order to galvanise the economy to growth, greater attention should be paid to profitability (Ricardo, 1951:72). Like Smith, was of the view that the accumulation process itself generates the needed number of workers. Labour power, in his analysis, was conceptualised as being elastic in supply at a given real wage basket. Hence, the rate of capital accumulation was regarded by Ricardo, in line with the argument of Adam Smith, as being endogenously determined (Lowe, 1954:108).

Turning to the views of classical economists on government debt, the aforementioned classical economists, together with J. S. Mill, share two major ideas in common. First, government expenditures are unproductive. In their argument, government expenditures are channelled towards satisfying certain basic needs in the society that should not be satisfied by the private sector. However, in the process of performing these social functions, part of the wealth so produced is consumed by the government itself. Second, it is argued that savings and investment are automatically equal without any equilibrating intermediation from such factors as changes in interest rate or changes in income via the multiplier in line with the neoclassical economics or the Keynesian economics respectively. This indicates that the economy as a whole is expected to

always be in equilibrium with regard to demand and supply, hence, cases of generalised overproduction of goods cannot arise (Tsoulfidis, 2007:2).

In Smith's argument, budget deficits should be totally avoided by the government because debt accumulation is pernicious in an economy, even if all of it is internally borrowed. He argues that the repayment of the borrowed funds would soon have to be sourced from increased taxation which could trigger capital flight from the economy and concomitant currency devaluation which could hurt the remaining producers in the economy (Smith, 1776:92). Judging from their consensus conclusion that government expenditures are unproductive, Smith asserts that debt substantially slows down the growth of the economy since it entails diverting funds from the private sector, which should be channelled towards productive activities into financing the government's unproductive activities. He therefore proposed that the government should always pursue balanced budgets in which all its expenditures would be financed through taxation. He justified this proposition by arguing that as opposed to public debt which crowds out an equal amount of private investment; and which subsequently inhibits the economy's accumulation capacity through impingement on savings, taxation primarily exerts negative impacts on the expenditure of households, with just a minuscule effect on savings (Smith, 1776:87).

In examining the issue of government debt, David Ricardo agrees with Adam Smith on his position in that he also viewed government expenditures as unproductive and that public debt crowds out investment and cripples the economy's wealth accumulation capacity. On the other hand, however, Ricardo has been associated with the argument that financing public expenditures through taxation is tantamount to doing same through borrowing - an idea that many modern economists refer to as the Ricardian Equivalence Theorem (Barro, 1974:1096).

This theorem is based on the view that while the government expenditures remain unchanged, current lowering of tax and budget deficit entail increasing future tax obligations. Put differently, borrowing to reduce taxation does not necessarily imply that the tax burden would decline, but rather, it implies that it has merely been postponed (Elmendorf & Mankiw, 1999:33). Nevertheless, many economists are unconvinced about the practical usefulness of the theorem based on evident link between budget deficits and different facets of economic activity and financial market conditions (Eisner, 1986:90). Moreover, while Ricardo gives the impression that he is in full

support of the theorem, a more careful study of his works shows that his position on the theorem might be that it only holds in the case of financing of a war (Ricardo, 1951:69).

Even though J. S. Mill held similar views to those of Smith and Ricardo as regards the unproductive nature of government expenditures as well as the methods of financing public expenditure, he took the argument further by asserting that public debt might not necessarily exert a pernicious influence on the economy under certain circumstances. These circumstances include cases where the debt is financed from foreign savings or when it engenders savings that would otherwise not have taken place or when it takes in domestic savings that would otherwise, have been invested abroad or in unproductive activities (Mill, 1976:293). He also took exception to the argument that increase in the rate of profit was partly responsible for the increase in interest rate. In his own view, while government borrowing depressed private capital through its crowding-out effect, it also escalated competition among workers leading to a decline of the real wage which translated into higher profit rates for the economy.

These contributions of J. S. Mill to the arguments of classical economists on public debt automatically predisposes their theory to empirical testing with results from different empirical evaluations justifying the concerns of the classical economists on the size of government debt vis-à-vis its consequences (Barro, 1989:52; Tsoulfidis, 2007:11). The empirical findings suggest the theoretical analysis and intuition of the classical economists are in agreement with available empirical findings and are capable of spurring further studies within their theoretical framework.

3.2.2 The Harrod-Domar growth model

The Harrod-Dormar model can be best described as a Classical-Keynesian model of economic growth, as Keynes' short-run analysis is employed to examine long-run issues in the model. It was first developed by Harrod (1939) who formulates a theory that stipulates the conditions for attaining long-run equilibrium growth. His work was followed by that of Domar (1946) which advocates a dynamic analysis of the long-run growth. Despite their separate evolutions, the two models share some similarities especially as regards assumptions and results; hence, the model is widely known as the Harrod-Domar model. The model analyses the growth rate from the viewpoint of savings rate in relation to capital productivity. The proponents of the model identify three major

types of growth that an economy can experience at any point in time to be warranted growth, natural growth and actual growth.

The main assumption of the model is that for growth to be attained, aggregate demand and aggregate supply of goods and services must be in equilibrium where investment (I_t) is equal to changes in income $(Y_t - Y_{t-1})$, multiplied by capital to output ratio (k). It is also assumed that intended investment (I_t) will always be equal to intended savings (S_t) in a closed economy with no leakages. From these assumptions, the following equation (3.1) is derived:

$$I_t = S_t = k(Y_t - Y_{t-1}) \tag{3.1}$$

where I_t is level of investment at a period, S_t is level of savings at a period, Y_t is national income at a period, and k is capital to output ratio.

Dividing equation (3.1) through by Y_t, we have:

$$\frac{I_t}{Y_t} = \frac{S_t}{Y_t} = k\frac{(Y_t - Y_{t-1})}{Y_t} \tag{3.2}$$

Some of the constituents of equations (3.2) are thus defined:

$s = \frac{S_t}{Y_t}$ = savings rate

$g = \frac{(Y_t - Y_{t-1})}{Y_t}$ = growth rate

By implication, $s = kg$, where k is the capital-output ratio

By making g the subject of the formula, we have:

$$g = \frac{s}{k} \tag{3.3}$$

Equation (3.3) represents the Harrod-Domar growth equation. It indicates that growth rate is jointly determined by the savings rate and capital-output ratio. By implication, the model highlights the very real possibility of the economy's growth rate by increasing the rate of savings (and by implication, investment) or by reducing the capital-output ratio.

Although the model is not explicit about the relationship between debt and economic growth, the views of the proponents are largely in line with those of the classical economists, except that they employ the short-run analysis of Keynes in their study of long-run problems, for which they have been heavily criticised, and more or less confined to the realm of historical interest. The model is, however, still highly appreciated as a major step from the classical theory to the neoclassical theory.

3.2.3 The neoclassical growth theory

The neoclassical growth theory developed in response to the growing dissatisfaction with the earlier growth theories, some of which attribute underdevelopment to heavy reliance on dictates from outside the economy. However, according to the neoclassical economists, underdevelopment is merely a consequence of misallocation of resources which mostly arise from inefficient pricing and unbridled government interference (Todaro & Smith, 2006:243). Essentially, the neoclassical growth theory explains how growth can be reached with the right combinations of labour, capital and technology, which are described as the driving forces of growth. The theory also rejects the Harrod-Dormar model's assumption of fixed proportions of labour and capital as the main drivers of growth. Instead, the model is extended with the addition of labour as a factor of production and varied capital-labour ratios. By this refinement, capital intensity could be differentiated from technological progress.

The theory also advocates the free market system, liberalisation of domestic markets and supremacy of the price mechanism for efficient allocation of resources in the economy. The theory furthermore indicates that the price mechanism encourages the factor inputs by causing the sizes of labour and capital in the production function to vary in a bid to attain the equilibrium state, such that with the addition of new technology, labour and capital would be adjusted in order to maintain the equilibrium level of growth. Notable among the first set of models that attempt to explain growth within the neoclassical framework are the Solow (1956) and the Swan (1956) models. Their model which signals the starting point for most studies on growth up to the present day portray labour, capital and technological change as the main factors responsible for long-run growth, where the level of technological change is exogenously determined and independent of the other factors. The critical assumption of the model is that it has constant returns to scale as a

feature. Other assumptions of the model include availability of complete information and perfect competition, as well as absence of externalities. A Cobb-Douglas production function and a capital accumulation equation are presented by Solow (1956) and Swan (1956). The Cobb-Douglas production function is as follows:

$$Y(t) = K(t)^{\alpha}(A(t)L(t))^{1-\alpha} \tag{3.4}$$

where Y is GDP, K is capital, A is labour-augmenting technology, L is labour, t is time, and α is elasticity of output $(0 < \alpha < 1)$.

The capital accumulation equation, which denote the investment equation is given as:

$$\frac{dK}{dt} = sY(t) - \delta K(t) \tag{3.5}$$

where s is proportion of GDP saved, and δ is depreciation rate.

From equations (3.4) and (3.5), s, δ, growth rate of labour (denoted by n) and growth rate of technology (denoted by g) are exogenously determined. Any positive change in K and L will increase Y and enhance growth. The model is characterised by constant returns to scale, implying that doubling K and L automatically doubles Y.

Equation (3.5) can be re-written as:

$$\dot{K}(t) = sY(t) - \delta K(t) \tag{3.6}$$

$\dot{K}(t)$ is the short form for $\frac{dK}{dt}$, which represents the change in capital stock over time. $sY(t)$ is gross investment, while $\delta K(t)$ is the amount of depreciation in the production process, which increases as investment (or savings) per person and capital per person increases.

Since the production function $Y(K, AL)$ has constant returns to scale, equation (3.4) can be expressed as:

$$\frac{Y(t)}{A(t)L(t)} = \frac{K(t)^{\alpha}(A(t)L(t))^{1-\alpha}}{A(t)L(t)} = \frac{K(t)^{\alpha}}{(A(t)L(t))^{\alpha}} = k(t)^{\alpha}$$

Therefore,

$$y(t) = k(t)^{\alpha}$$

where $y(t)$ is output per effective labour, labour grows exogenously at the rate of n, technology level grows at the rate of g, while effective labour, $A(t)L(t)$ grows at the rate of $(n + g)$. From this analysis, the intensive form of the Solow-Swan production function can thus be expressed as:

$$\dot{k}(t) = sy(t) - \delta k(t) - gk(t) \tag{3.7}$$

Since $y(t) = k(t)^{\alpha}$, we can substitute k for y and factor out $k(t)$ in the capital accumulation equation to get:

$$\dot{k}(t) = sk(t) - (n + g + \delta)k(t) \tag{3.8}$$

where $sk(t)$ is actual investment per unit of effective labour and $(n + g + \delta)k(t)$ is break-even investment (the amount of investment that must be invested to prevent k from declining). This equation indicates that $k(t)$ converges to a steady-state value defined by:

$$sk(t) = (n + g + \delta)k(t) \tag{3.9}$$

At this steady state, capital intensity neither increases nor decreases. Convergence to the steady state can be attributed to the rate of savings and capital accumulation. In other words, higher savings rate with appropriate investment level leads the economy to converge to a steady state of growth. The model predicts that poor countries would grow speedily if the share of GDP invested in capital accumulation is increased according to the maximum share of GDP that can be invested. This would lead to the stabilisation of saving rates and the convergence of growth per labour to the lower steady state, which is determined by technological progress.

As regards the relationship between debt and economic growth, some neoclassical economists have made some important contributions which have continued to be subjects of empirical investigations up till the present day. Notable among such contributions is that of Diamond (1965:1147), who through his overlapping generation model differentiates the impacts of foreign and domestic debts on the economy. From his perspective, the effects of foreign and domestic debts on the economy can be grouped into two. From the first classification, external and domestic

debts can affect the level of utility by causing changes in taxes paid and in the relative factor payments. In line with this first classification, the effects of the taxes required to finance either external or domestic debt are the same in the long run for individuals in the society. As for the second classification, he asserts that changes in utility arising from internal debt can be classified into the impacts of external debt and the impacts of a debt swap, which are tantamount to four effects, two on factor payments and the remaining two in the form of changes in taxes.

In his analysis, Diamond focuses mainly on the effect of taxes on factor payments, as other aspects of the effects of debt on the economy have been dealt with by other neoclassical economists. From his theoretical model, he infers that in cases where both external and domestic debts are present, while domestic debt reduces utility in the efficient case, it might increase or decrease it in the inefficient case, but would definitely enhance it in the inefficient case in the absence of external debt. Moreover, he posits that external debt reduces utility in the efficient case and might depress or enhance it in the inefficient case, regardless of whether or not domestic debt exists.

In a related theoretical modelling, Blanchard (1985:245) considers the impact of regular fluctuations in output on an open economy and the role of debt in such a situation. In his model, the economy's total financial wealth is defined as the sum of its foreign assets and government debt. His equation of motion indicates that the two components follow symmetric, but opposite paths. That is, an increase in government debt depresses the foreign assets in the country's portfolio, which has no effect on the open economy's rate of interest and capital accumulation. However, he opines that the same debt policy would have a debilitating effect on a closed economy, as changes in capital stock would affect both rates of interest and capital accumulation. Some other neoclassical contributions to the role of debt in the economy include those of Modigliani (1961:752) and Vickrey (1961:136) who theoretically analyse the fall in the stock of capital as a result of substituting capital with debt and Bowen *et al*. (1960:705) who discuss the tax effects of domestic debt on the economy.

3.2.4 The endogenous growth theory

The endogenous growth theory is a theory of growth that attributes growth in an economy to endogenous, rather than exogenous forces. The theory was proposed in the mid-1980s because of continued dissatisfaction among certain theorists such as Romer (1986) and Lucas (1988) with the

popular view that exogenous forces determine long-run growth. They are opposed to the model of growth that entails the exogenous growth variable in the form of the unexplained technical progress in favour of a growth model within which the key determinants of growth are elucidated. Specifically, the neoclassical growth model of Solow (1956) and Swan (1956) operates under the assumption that the rate of technological progress which is a major variable in the model is driven by a process that is unconnected with economic forces, thereby implying that the long-run growth can be taken as exogenous to the economic system.

This proposition is rejected by the endogenous growth theorists who suggest the channels through which technical progress can be determined by economic forces. They begin their analysis with the proposition that innovation can engender technological progress, as it brings about new products, processes and markets, which are mostly end products of economic activities. Consequently, growth is said to be propelled on the one hand, by savings and investment in human capital (Lucas, 1988:40), and on the other hand, by investment in research and development (Mattana, 2004:84).

The AK model, which does not differentiate capital accumulation from technological progress constitutes the first edition of the endogenous growth theory. In an earlier variant of the AK model, Frankel (1962:997) argues that a constant or even increasing marginal product of capital could characterise the aggregate production function, hence, the model is predicated on being characterised by absence of diminishing returns to capital. Romer (1986:1035) introduce a similar variant of the model; nevertheless, with the assumption that intertemporal utility maximisation formulates savings. Furthermore, a similar model was formulated by Lucas (1988:4) who gave much greater prominence to human capital than to physical capital. As a major assumption, both technical progress and human capital are equated.

The second category of the endogenous growth theories is the innovation-based endogenous growth theory, which differentiates between innovation-induced intellectual capital/technological progress and saving/schooling-induced human capital (Romer, 1990:71). Romer also affirms that productivity growth is enhanced by innovation through the creation of new, but not necessarily improved, variety of old products. Nonetheless, this position is not acceptable to another version of the innovative-based endogenous growth model known as the Schumpeterian theory, which

emphasises innovations that discourage the use of old products by leaving them out of date. As put forward by Grossman and Helpman (1991:35) who are major proponents of the theory, growth is stimulated through innovation by creating improved versions of old products. From the foregoing, it is therefore clear that from the viewpoint of the innovation-based endogenous growth theory, the path to growth lies in committing a substantial proportion of output to research and development, rather than to savings.

In endogenous growth models, it is generally held that public debt has a deleterious effect on growth. In fact, the proponents of these models could find no way to make a case for public debt as opposed to the neoclassical growth model where it is held that increase in public debt can be beneficial only if the economy is growing faster than the rate of interest, such that it leads to over-accumulation of capital (Blanchard, 1985:230; Diamond, 1965:1145). This neoclassical model by Blanchard (1985) was extended by Saint-Paul (1992:1255) within an endogenous growth framework in line with Romer (1986) and Lucas (1988) with the assumption of constant returns to capital at the aggregate level. From the resulting endogenous growth model, it is established that an accumulated public debt is associated with decline in economic growth, hence, it constitutes a fiscal action with negative consequences for a future generation. On the other hand, it is established that even though a reduction in public debt enhances the rate of economic growth, it cannot be Pareto-improving as it constitutes a fiscal action with negative consequences for a current generation.

Furthermore, Diamond (1965)'s Overlapping Generations model is extended to discuss the impacts of public debt on endogenous growth by Brauninger (2005:838) within the framework formulated by Romer (1986) and Lucas (1988) and with the assumption of an AK production structure which encapsulates the basic ideas of the models. It is also assumed that the government is in control of three instruments in connection with budget deficits: the government purchase ratio, the budget deficit ratio and the tax rate. From his endogenous model, it is established that capital growth and public debt growth are both functions of the deficit ratio and the debt-capital ratio and both capital and public debt growth rates remain constant if the debt-capital ratio is constant. If the deficit ratio falls below a critical level, then there are two steady states that see the equalisation of the rate of growth of capital, output and public debt. In this case, increasing the deficit ratio depresses the growth rate. On the other hand, if the deficit ratio outstrips the critical level, then no

steady state exists and by implication, the growth of capital falls continuously, even to zero in finite time.

3.2.5 The Keynesian theory

The foundation for the Keynesian theory was laid by Keynes (1936) in his originative publication, *The General Theory of Employment, Interest and Money,* which completely rejects the classical economists' assumption of absolute flexibility of wages and prices. It also rejects the Say's law, "*Supply creates its own demand"* by arguing that given the scale of macroeconomic activities and enormity of resources in the modern economy, full production and full employment cannot be attained merely by relying on the market mechanism, which the classical economists refer to as the "invisible hand".

From Keynes' argument, the level of real national income, and therefore, employment is determined mainly by the level of aggregate demand, which implies that demand determines how much is supplied. He therefore attributes the existence of unemployed resources in the economy to inadequate spending in the aggregate, as all income generated by an economy's output is not necessarily expended on goods and services produced, since the overall level of spending depends mainly on the disposable income of consumers. He therefore advocates the need for government intervention through expansionary policy to enhance aggregate spending and consequently reduce the unemployment rate directly.

Keynes' theory, which is primarily a short-run analysis, adopts the Aggregate demand-Aggregate supply framework to model the relationship between output, employment and inflation. He assumes that the aggregate supply curve is upward sloping and that changes in the demand side of the economy affects both prices and output. This is because such factors as fiscal and monetary policies, changes in expectations and labour force can influence inflation rate and output level in the short run. As such, the theory establishes a positive relationship between inflation and output such that increase in the prices of goods and services would not lead to a decline in output because producers would have to satisfy the demand requirements of consumers. It is argued further that an increase in the quantity of money leads to a fall in interest rate, which in turn stimulates investment and aggregate demand, thereby enhancing output and employment. By this, the Keynesian theory analyses the link between the real and the monetary sectors of the economy, as

portrayed by the remarkable IS-LM model which depicts equilibrium in the goods and money markets.

As opposed to the position of the classical economists, Keynesian economics does not regard some government expenditure or any other expenditure as unproductive expenditure; therefore, incurring debt to finance consumption is deemed comparable to incurring debt for investment purposes, because consumption expenditure enhances investment. From Keynes' perspective, an increase in debt would enhance growth in the economy through multiple effects: notable among these is stimulation of effective demand, which would lead to increased employment and output. Furthermore, Keynesian economics links public debt with deficit financing, thereby rejecting the traditional classical position that an incessantly unbalanced budget and rapidly increasing public debt is deleterious to the economy. Hence, from Keynes' view, extensive government debt is considered to be a national asset rather than a liability.

The analysis of Keynesian economists on public debt reaches its high point with the functional finance theory by Lerner (1955:475) which holds that the absolute size of government debt does not matter at all and that interest payment on public debt does not constitute any burden to the economy, no matter how high it is. Rather, he proposes that the appropriateness or otherwise of public debt should be examined in light of the nature of expenditure for which it would be employed and its income generating potential. This analysis is predicated on certain assumptions. First, incurring public debt does not entail any transfer of the real debt burden to the future generation. Second, the analogy between public debt and private debt is wrong, and lastly, a very clear distinction exists between domestic debt and foreign debt. Moreover, he asserts that as public debt grows, channels of savings in the economy are deepened through the development of more institutionalised sources of savings such as money and capital markets, and this translates to improved investment and economic growth.

Meanwhile, in the 1950s, in the face of accumulated and rising public debt coupled with unbridled public expenditures with very high unproductive components, some post-Keynesian theorists re-awakened the controversy surrounding the impact of government debt on the economy. Notable among these theorists was Buchanan (1958:1) who disproved the three basic assumptions of the functional finance theory, which he referred to as the new orthodoxy.

3.2.6 The debt overhang hypothesis

Debt overhang has been described as a situation where the expected payback on a country's debt is lower than its current face value. It has also been defined as a situation where an economy's inherited debt is so massive that the lenders are not fully persuaded that they would recoup their funds in full (Krugman (1988:254). The concept has its foundation in the works of Myers (1977:152) who condenses the issue into a case of a corporation that has current and future assets that generate current and future cash flows. Consequent upon the corporation's indebtedness and agreement with the creditor, a portion of its future cash flows would be paid to the creditor as loan repayment, which would generate an effect in the form of a disincentive to the corporation's investment plan.

However, Krugman (1988:256) points out a clear difference between corporations and countries with regard to their income streams, as well as their current and future investments. In his argument, a corporation typically has a probability distribution of streams of future earnings from which it could service its debts. He argues that while a country possesses a similar probability distribution, its case differs markedly from that of a corporation because a corporation can commit its entire income streams to servicing its debts, but a country can only commit a fraction of the national income to debt servicing as there are issues of greater priorities that it must commits its funds to. Moreover, in situations of severe default, a corporation could be taken through bankruptcy procedures which enable maximum possible debt repayment to creditors; but in the case of a country, its sovereignty ensures that it cannot be compelled to service its debts, neither can it be liquidated. Its future access to credits may, however, be restricted or a lien could be placed on its foreign assets.

From Krugman's (1988) analysis, the channel through which the negative impact of debt is transmitted to investment is debt servicing consequent upon debt accumulation. According to Myers (1977:153), assuming the cost of investment opportunity facing a country is I, while the present value of the investment is $PV(s)$, the country would decide to invest if $PV(s) \geq I$, in which case the investment is expected to enhance the economy's output. If the country becomes indebted, investment will be negatively affected because a portion of the country's future incomes or investments $[PV(s)]$ will be used to service the debts. Hence, the new decision rule which now

incorporates the cost of debt servicing will be to invest if $PV(s) \geq I + P$ where P denotes promised payments in form of debt servicing. This new decision rule implies that a better outcome of investment is now required for the said investment to be undertaken. In some cases, the need to service debt would turn some investments with positive net present values (NPVs) into investments with negative (NPVs) owing to distortions of future revenues, hence, a rejection of some investments which were originally positive NPV investments, since their full benefits would not be realised by the country.

Furthermore, the negative effect of debt overhang on investment is divided into two by Deshpande (1997:172). He regards the first effect as the pure disincentive effect, which usually results from the obligatory debt servicing weakening investors' incentives to invest as debtor countries just share part of the increase in export and output. Since investors most likely know the proportion of increase in production and exports that go into debt servicing, they are discouraged from investing heavily in the economy, thereby leading to further problem of capital flight. The second effect identified is the impact of adjustment measures, usually midwifed by the IMF in the discharge of its role as the arbiter in negotiations between creditor and debtor countries in difficulties. Notable amongst these adjustment measures is an exchange rate devaluation and reduction in government deficits; the brunt of which, it has been argued, is to be borne by investment.

In light of the foregoing, Krugman (1988:1) posits that creditors and debtor countries face the dilemma of choosing between issuing forgiveness of debt to debtor countries so as to protect incentives or financing the debts, so as to elicit full repayment of a loan. To escape this trade-off, he suggests a conversion of debt into state-contingent claims. This position has been formulated into a model by Cohen and Sachs (1986) and Cohen (1995).

3.2.7 The debt Laffer curve

The concept of debt Laffer curve was introduced by Sachs (1989) as an appraisal tool that creditors can employ to evaluate a debtor country's solvency from the viewpoint of debt overhang. The curve exemplifies the case of a country whose debt is so colossal that it transcends an internally-determined debt threshold which may result in losses of efficiency, consequent upon which the nexus of the economy's debt at nominal and market values could take on the shape of a Laffer curve. According to Sachs and Huizinga (1987:556), the likely efficiency losses could include the

pricy and time-consuming debt rescheduling negotiations between creditors and debtor. The said likely efficiency losses would also include, the potential disruptions of trading arrangements due to the possible breakdown of negotiations, which could affect the debtor's current trade and be a possible disincentive to investment in favour of consumption, due to potential debt tax on future returns on investment.

The concept of the debt Laffer curve has been employed by Sachs (1989:89) to make a case for debt forgiveness in favour of heavily indebted countries. He argues that if a debtor country is on the wrong (or declining) side of the debt Laffer curve, a decrease in outstanding claims will not only preserve the current market value of debt instruments, but will also enhance the value of the outstanding claims to the creditors' advantage. However, he asserts that debt forgiveness will lead to a loss for the creditor if the debtor country is on the correct (or increasing) side of the debt Laffer curve, as this will not lead to a rise in the market value of the debt.

The formal framework for the debt Laffer curve was formulated by Krugman (1989:9) who links the ability of debtor countries to service and repay their debts to their debt levels. He argues that when a country incurs so much debt that its obligations become impossible to redeem, these obligations potentially take the form of a high marginal tax rate on the economy and constitutes a disincentive for the government to implement measures that will improve the economy because the gains thereof will accrue to the creditors, rather than to the economy. Moreover, the debt will be financed through taxation of domestic taxpayers' capital. This too, would also act as disincentive to investment in the local economy.

The fundamental logic of the debt Laffer curve as presented by Krugman (1989:9) is represented in Appendix 1. He posits that an economy with a debt level whose face value is associated with a lower market value can either be on the left side of point B, which represents the utmost market value of debt that it can attain or on the right side of point B. As indicated in Appendix 1, there is a 1-to-1 relation between the market and face values of public debt up to point A, because at lower debt levels, the creditors expect a full repayment of the loan. When nominal value of debt rises above point A, its market value begins to increase more slowly because the higher a country's accumulated debt is, the harder it becomes to finance it, even as the risk of default becomes greater. Therefore, debt accumulation leads to a decline in the market value of debt and its marginal

profitability starts declining right to the point of A, but its market value still continues on the upward trend. Therefore, if the country's debt level equates with a point on the curve between points A and B, the country is viewed as being on the correct side of the curve in which case debt forgiveness will not bring about an increase in the market value of the debt. On the other hand, if the country's debt level equates a point on the curve to the right side of point B, increasing its nominal value cannot compensate for the decline in its market value, hence, the country is viewed as being on the wrong side of the curve, indicating that the economy suffers from debt overhang. In this case, debt forgiveness will bring about an increase in the market value of its debt.

From the foregoing, it is clear that the debt Laffer curve is very useful in identifying when debt reduction can be of benefit to the economy or otherwise. On this background, the debt Laffer curve captures the discussion on the existence or otherwise of nonlinear relationship between debt and growth, which suggests that debt has a positive effect on growth up to a certain threshold beyond which its effect becomes negative. Specifically, the concept of nonlinearity in the debt-growth nexus states that at moderate levels, debt stimulates growth, but beyond a certain point, debt depresses growth due to its crowding-out effect (Minea and Parent, 2012:14; Presbitero, 2010:9; Reinhart and Rogoff, 2010:575).

3.3 EMPIRICAL LITERATURE

This section begins with a discussion of the existing empirical literatures on the relationship between debt and economic growth, followed by the channels of transmission in the relationship between the two macroeconomic variables. The relationship between institutional quality and economic growth is also discussed, while the last sub-section is devoted to the role of institutional quality in the relationship between external debt and economic growth.

3.3.1 Relationship between debt and economic growth: linear investigations

Hundreds of research studies have been conducted in a bid to understand the relationship between debt and economic growth over the last several decades. In a study of the impact of external debt on economic growth for SSA countries between 1971 and 1994, Iyoha (1999:44), using a two-stage least squares technique claims that an excessively high external debt stock is deleterious to investment and slows down the rate of economic growth. In a similar study on the effect of external

debt on economic growth in 35 sub-Saharan African countries over the period 1980 to 1990, Fosu (1999:311) employs the ordinary least squares (OLS) method and concludes that external debt is harmful to economic growth. In slight contrast to the findings of Iyoha (1999), however, he finds limited evidence of an indirect link between external debt and investment levels. Furthermore, by focusing on the Italian economy, the differences in the effects of domestic and external debts on economic growth is analysed in a study by Balassone *et al.* (2011:12-15) that covers various sub-periods between 1861 and 2010. The authors fit the endogenous growth model to the time series data for the empirical analysis which shows a negative correlation for the country over the entire sample. They further argue that external debt played a greater role in the stronger negative impact of debt on growth before 1914.

Meanwhile, a structural analysis of the relation between external debt and economic growth in ten selected Asian and Pacific countries by Chowdhury (1994:1129) generates an inconclusive result. The study which applies Granger causality and three-stage least squares techniques to pooled annual data for the period 1970-1988 neither supports nor disproves the proposition that external debts of developing countries constitute a drag on economic growth. Subsequent to the mixed result, further tests are carried out, the conclusion of which is that external debts of developing countries are not a primary cause of drag on growth, in line with the claim by Bulow and Rogoff (1990:41). In similar vein, Clements *et al.* (2005:16) in a study on the effect of debt burden on public investment for 55 low-income countries, apply a system General Method of Moments (GMM) method to annual data for the sample countries and concludes that huge debt stocks have not seriously hampered public investment. In addition, they conclude that debt relief has only resulted in more consumption for most countries, rather than resulting in greater investment.

An interesting study on the issue of the relevance of external debt-servicing constraint on the attainment of inclusive growth has been conducted by Fosu (2010:23). The study employed Seemingly Unrelated Regression (SUR) analysis on panel data for 35 African countries over the period 1975 to 1994, and concluded that the burden of debt servicing would discourage expenditure on health and education sectors and possibly from public investment too. He further claims that debt relief would have positive and substantial fiscal impacts on the social sectors. These results are contrary to the claims by Clements *et al.* (2005:16) who posit that high debt stock has not hampered investment and that debt relief has led to more consumption. Furthermore, the

findings do not entirely support the conclusions in another study by the same author, Fosu (1999:316), where the author examines the impact of external debt on economic growth in 35 SSA economies, with the aid of augmented production function and concludes that evidence of a negative relation between debt and investment levels is weak. Further, he posits that external debt is detrimental to output in respect of production inputs at certain values, and that in the absence of the debt burden, the growth rate in the SSA would have been much higher.

Furthermore, in a study on the effect of the external debt burden on growth and development in Nigeria, Ajayi and Oke (2012:302) employed the OLS technique and claim that the external debt burden exerts a negative impact on the country's national income and other macroeconomic indicators. In a related study, Omoju *et al.* (2012:162) investigated the effect of external debt on economic growth in Nigeria between 1970 and 2007. Both Granger causality test and OLS regression were conducted and it was concluded that a bi-directional causal relationship exists between external debt and economic growth in the country. Moreover, the regression results reveal that external debt negatively affects economic growth in Nigeria. However, a study on Nigeria that employed a VECM on time series data for the period 1970-2007, which was undertaken by Ogunmuyiwa (2011:33) produced contradictory finding – where it was concluded that there is no causal relationship between external debt and economic growth. Another study that also focused on Nigeria was undertaken by Amassoma (2011:324), who employed the vector autoregressive (VAR) econometric technique to investigate the causal relationship between internal debt, external debt and economic growth. The results indicated that a long-run relationship exists between external debt and economic growth in the country. Furthermore, it was found that a unidirectional relationship exists between economic growth and external debt, running from the former to the latter.

Still on Nigeria, the St. Louis modelling technique was used by Ezirim *et al.* (2004b:1) to show that external debt exerts a positive impact on Nigeria's economy, with full scale effects felt in the third and fourth years of the debt. The authors however, claimed that huge debt servicing affects growth negatively, but that this negative effect turns positive after about four years of consistent debt servicing. Dual results have also been generated in a much more recent study on the relationship between external debt and economic growth for Nigeria by Olasode and Babatunde (2016) who employed the Autoregressive Distributed Lag (ARDL) and time series data from 1984

to 2012. Their finding indicates that lag 1 of external debt affects the economy positively, while external debt in the current year affects it negatively. In a similar study, Egbetunde (2012) employed OLS and a cointegration test to investigate the effect of debt on growth in Nigeria for the period 1970-2008. The study's results revealed that external debt has positive effect on economic growth over the study period.

In another interesting study on the structure of the external debt of Kenya as well as its implications for economic growth, Were (2001:17) focussed on three debt variables: external debt accumulation, debt servicing and current debt inflows and used the error correction formulation on time series data for Kenya that captured the period 1970-1995. The study confirmed the existence of the problem of debt overhang in Kenya, indicating that external debt accumulation negatively affects growth and private investment. The results, however, suggested that debit servicing does not appear to affect economic growth negatively, but has some crowding-out impact on private investment. Moreover, it claimed that current debt inflows stimulate private investment. In a similar study on Ghana, Osei (2000:23) used time series data on the External debt-GNP ratio and debt service ratio for the period 1983-1990, and found that external debt affects the country's economy in a negative manner. In another study, the relationship between external debt and economic growth for Pakistan was investigated by Malik *et al.* (2010:98). Using the OLS method on time series data extending from 1972 to 2005, they concluded that both external debt and debt servicing have a negative effect on economic growth. This result is supported by another study on the impact of public debt on growth for Pakistan, by Rais and Anwar (2012:542) for the period 1972 to 2010. They concluded that both internal and external debts have negative effects on economic growth in the country.

By focusing on Pacific Island countries, Jarayaman and Lau (2008:281) investigated whether external debt leads to economic growth or not. The study employed the Fully-Modified OLS and panel data for six selected countries for the period 1988 to 2004. The study concluded that there is no long-run relationship between external debt and economic growth, but that there is a causal positive linkage from external debt to output through budget deficits and exports. It was also claimed that short-run bi-directional causality exists between external debt and economic growth in the sample countries. The findings in this study have been corroborated by the findings of a similar study that focussed on Asian countries. By using panel VECM and annual panel data for

seventeen Asian countries over the period 1988 to 2006, Lau and Kon (2014:2173) concluded that external debt affects economic growth positively, particularly in the short term, both directly and indirectly through its positive impact on exports. In another related study, Borensztein (1990:333), in his analysis of the effect of external debt on investment in a heavily indebted country simulated a simple rational expectations growth model and came to the conclusion that access to more external debt funds would engender greater positive impact on the country's investment to GDP ratio than a mere reduction in existing debt stock would.

In an investigation of the long-run relationship between public debt and economic growth in one hundred and eighteen countries covering five different spectrums of income levels, ranging from low-income countries to high-income countries, Eberhardt and Presbitero (2015:12) applied the error correction model (ECM) to panel data for the period 1961 to 2012, and came to the conclusion that an indirect relationship exists between public debt and long-run growth across the sample countries. Similarly, in their investigation of the interaction between external debt, public investment and economic growth in fifty-five low-income countries, Clements *et al.* (2003:18) used panel data from 1970 to 1999, as well as the econometric techniques of fixed effects and system GMM to find that high debt stock constitutes a drag on economic growth in low-income countries. In addition to this, they concluded that external debt impacts economic growth indirectly through its negative effect on public investment.

In his seminal article, Krugman (1988:267) investigated the trade-off options that face the creditors of a debtor economy, with huge debt stock that prevents it from being granted further loans (in which case the country is deemed to be suffering from debt overhang), and stated that the trade-off choice available to the creditor countries lies between financing and forgiveness. He further concluded that the options can be improved, provided they are carried out subject to factors that the country cannot influence. Several research works have been conducted to verify the soundness or otherwise of debt overhang (Krugman, 1988:267). In a cross-country study of the effect of debt on growth in highly indebted countries, Karagol (2002:1106) found that the slowdown in investment and growth was partly from debt overhang effects. Moreover, he concluded that the effect of debt on growth remains inconclusive and that country-specific factors are prominent in determining the nature of the relation between debt and growth in countries under study.

Furthermore, by working within the framework of an augmented production function in a study on the effect of external debt on economic growth for thirty-five SSA countries between 1980 and 1990, Fosu (1999:309) asserted that the debt overhang hypothesis indicates an indirect effect of debt on growth through its diminishing effect on investment. Likewise, in their investigation of debt-growth relations for ninety-nine developing countries, including sub-Saharan Africa, Elbadawi *et al*. (1997:57), used cross-section regression to affirm a debt overhang effect on economic growth for the sample countries. While they concluded that debt accumulation depresses growth, they however, deduced that debt stock enhances growth. Furthermore, they identified three channels through which debt burden slows down economic growth in sub-Saharan Africa: the current debt inflows-GDP ratio; past debt accumulation and debt servicing. This finding was also corroborated by Mbanga and Sikod (2001:14) who confirmed the existence of debt overhang crowding-out effects on public and private investments in Cameroon. Evidence in support of the debt overhang hypothesis was also found by Shabbir (2008:1485) in his investigation on the effect of debt on growth for twenty-four developing countries. Moreover, he concludes that external debt affects economic growth negatively, and that debt servicing exerts a crowding-out effect on investment.

In the case of Nigeria, Essien and Onwioduokit (1998:13) validate the effect of debt overhang hypothesis in the West African country. They argued that debt servicing, as well as the debt burden restrain the country's access to foreign exchange to import capital goods and other resources needed to stimulate growth. The study also demonstrates that effecting a small change in the country's external debt stock would have a multiplier effect on economic growth. Contrary to these findings however, the validity of debt overhang hypothesis for Nigeria was rejected by Audu (2004:1) who investigated the effect of external debt on economic growth and public investment in the country. The results from the study revealed that in contradiction to the debt overhang proposition, debt accumulation enhances growth in the country. Furthermore, he reported that debt servicing affects growth negatively, while it affects investment positively. Debt accumulation was also reported to exert a negative impact on public investment in the country.

According to Claessens (1990:1674) who carried out some analyses of the debt Laffer curves for the heavily indebted economies, including some SSA countries, just a few indebted countries are on the wrong side of their debt Laffer curve. He further concluded that for most countries, debt

forgiveness is not likely to be advantageous to the creditors collectively. A more comprehensive model that captures other factors that affect investment was employed by Hoffman and Reisen (1991:295), but they found little evidence for the debt overhang hypothesis on the basis of outstanding debt. They did however, assert that availability of liquidity is an important causal factor of investment. Moreover, in an attempt to re-examine the hypothesis supported by the debt-overhang literature that the growth collapse of the Latin American debtor countries was caused mainly by the debt crisis, Kaminsky and Pereira (1996:21) simulated the endogenous growth model, which was calibrated in the form of the economies of Argentina and Mexico. They concluded that once the effects of social inequality on government policy and consumption are accounted for, debt servicing becomes a crucial factor in explaining the break-down of investment and economic growth in Latin America.

Using the econometric technique of Instrumental Variable for a sample of seventeen OECD countries, Panizza and Presbitero (2014:18) examined whether public debt has a causal effect on economic growth. They concluded that public debt might not have a causal effect on economic growth in advanced economies. Then again, in another study on Mauritania, Mahmoud (2015:5) researched the role of external debt on economic growth by applying the co-integration technique, covering the period 1975 to 2005. He concluded that a negative relationship exists between external debt and economic growth. Meanwhile, the study revealed a positive link between debt servicing and economic growth. Similarly, in an empirical investigation into whether public debt promotes economic growth in China, Tasos (2012:239) employed the Granger causality test on time series data extending from 1984 and 2011. He concluded that causal relationships between government debt and economic growth could not be established for China.

Further, in an attempt to investigate the extent to which the external debt burden affects the growth of an economy, Siddique *et al.* (2015:18) used the panel ARDL method on annual data from 1970 to 2007 for 40 HIPCs. The researchers concluded that external debt has a negative relationship with economic growth. Specifically, they claimed that a reduction in the stock of debt in the sample countries would substantially enhance the performance of economic growth. In a similar study, Karagol (2002:1114), used multivariate cointegration technique to investigate the link between external debt and economic growth in Turkey for the period 1956-1996. The conclusions of the study indicate that in the long run, a negative relationship exists between external debt and

economic growth in the country. Moreover, results from the Granger causality test conducted indicated that a uni-directional causality exists between debt service and economic growth, with the causality moving from the former to the latter.

Apart from this, some other studies have come up with a more systematic analysis of debt issues by analysing it from the perspectives of capital inflows. For example, Metwally and Tamaschke (1994:604) investigate the relationship between debt servicing, capital inflows and economic growth for three North African countries, Algeria, Egypt and Morocco between 1972 and 1992. Using two-stage least squares and OLS techniques, they found that capital inflows have a substantial impact on the relationship between debt and growth. In addition, Cui and Gong (2008:1282) used an infinite-horizon model with Marshallian endogenous time preference in an examination of the effects of foreign aid on domestic capital accumulation and external debt. The results of their study indicated that in the long run, a permanent increase in foreign aid enhances both domestic capital accumulation and consumption, but leads to a decline in external borrowing. In the short run, they found that both a permanent and temporary increase in foreign aid initially enhances investment and depresses external debt levels.

In an analysis of the role played by international capital flows in the development process, Lane (2004:17) employed panel data of eighty-seven developing countries and discovered that the practice of credit rationing would curtail the role of international borrowing and lending in business cycle fluctuations. He further concluded that a positive relationship exists between trade openness and external debt. Furthermore, in an analysis of the determinants of long-term external debt for sixty-one developing countries, Colombo and Longoni (2009:12) used pooled OLS and data extending from 1970 to 2000, in their study. They asserted that in support of several models of credit rationing, the relationship between external debt, output level and trade openness is positive and strong. The result further pointed to the presence of binding credit constraints, which are only relaxed subject to the availability of high institutional quality and low political risk in the countries under investigation.

Furthermore, in his review of debt relief from 1980 to 2000, Easterly (2002:1692) established that there are no variations in the trends of terms of trade and wars amongst HIPCs and non-HIPC less-developed countries. He further affirmed that despite the financing of HIPCs shifting away from

private and bilateral non-concessional sources, the net present value debt of HIPCs remains on the high side. Looking in the direction opposite to capital inflows, Ndikumana and Boyce (2011:167) examined the linkage between capital flight and external borrowing and policy options in sub-Saharan African countries. Using panel data for thirty-three countries for the period 1970 to 2004, they employed the robust techniques of instrumental variable and GMM and found that sub-Saharan African countries suffer from what they referred to as debt-fuelled capital flight. Specifically, the findings indicate that about 60% of every fund into the African countries in the form of external debt flowed back out as capital flight. They also confirmed the existence of debt overhang effect: as more capital flights followed increasing external debt levels in later years.

Continuing the topic of capital inflows effect, Cohen (1993:446) analysed the relationship between external debt and investment in less developed countries for the 1980s. From his analysis, he found just minimal effects of debt on growth, but argued that the main factor that affects investment is net transfers. In addition, he claimed that debt service had a crowding-out effect on investment. Similarly, Olgun *et al.* (1998:13) carried out an investigation on the link between external debt, capital inflows, investment and growth in Turkey between the years 1965 to 1997. Using the techniques of two-stage least squares and three-stage least squares, they argued that the relationship between debt stock and debt service follows a two-way pattern, and that debt service has no impact on economic growth.

Meanwhile, some researchers had focused on the investigation of the implications of a huge debt burden on growth and other macroeconomic indicators. Cunningham (1993:122) investigated the link between debt burden and economic growth for sixteen heavily indebted countries over the period 1971 to 2007. From the study findings, he concluded that an excessive debt burden not only exerts a negative impact on economic growth, but also negatively affects the productivity of both labour and capital. This finding was corroborated by Sawada (1994:332) in a study of heavily indebted countries extending from 1955 to 1990. He found that heavily indebted countries generally suffer from the debt overhang effect. Researchers, Amoateng and Amoako (1996:25), in their examination of the link between external debt servicing growth and exports for thirty-five African countries, employed panel data between 1971 and 1990. They concluded that a positive uni-directional causal relationship exists between external debt servicing and economic growth.

Further, the effect of external debt on economic growth was investigated over the period 1978 to 2001 by Mohamed (2005:64) for Sudan. From his findings, it was established that external debt and inflation exert a negative influence on economic performance. He also concluded that export earnings affect economic growth positively. Moreover, in a similar study for the case sub-Saharan African countries, Iyoha (1999:18) used panel data covering the period 1970 to 1994. He determined that external debt constitutes a drag on investment in the region and that a reduction in their stock of external debt would enhance investment and economic growth. In another similar study, Deshpande (1995:185) employed the OLS and the maximum likelihood iterative techniques for a case of thirteen severely indebted countries between the years of 1971 and 1991. He found the relationship between external debt and investment to be significant and negative. These findings were however, rejected by Warner (1992:1183) who investigated whether the debt crisis had an impact on investment in thirteen less developed countries for the period 1982-1989. Using panel data and the OLS technique, the author affirmed that while external debt has no effect on investment, the slump in investment in the sampled countries was partly as a result of falling export prices, high global interest rates and slow growth.

3.3.2 Relationship between debt and economic growth: Nonlinear investigations

As observed in the previous sub-section, empirical studies report on the relationship between debt and economic growth can be grouped into two sections. The first group claims that debt influences growth positively, while the second group, subscribing to the most prevalent view, asserts that debt has a negative effect on economic growth, especially when incurred at high levels. In addition to these two classes, more recent studies have focused on the existence or otherwise of nonlinearity in the relationship between debt and growth, with most researchers who support the nonlinearity argument, proposing optimal debt levels beyond which debt becomes detrimental to growth.

By using a macroeconomic model, Iyoha (1999:30) conducted a simulation of the impact of external debt on economic growth in SSA countries ranging from 1970 to 1994. The result of the sensitivity analysis based on alternative debt stock reduction cases established that the reductions would lead to a significant improvement in the levels of investment and growth. For example, the finding demonstrates that on average, reducing debt by 20% would have caused investment and economic growth to rise by 18% and 1% respectively. He also advanced that debt overhang and

crowding-out effects are quite significant concerning growth in the countries and postulates that debt forgiveness could help to galvanise growth and investment in the region. This finding is supported by a comparable study conducted by Fosu (1996:106) who used panel data for thirty-five sub-Saharan African countries between 1980 and 1990. Based on his findings, he claimed that debt is deleterious to growth for given levels of production factors and, in the absence of the external debt stocks of these countries, economic growth would have increased by 50%.

In addition to this, in their analysis of the nonlinear effect of external debt on economic growth for ninety-three developing countries, Pattillo *et al.* (2002:19) utilised panel data covering the period 1969 to 1998. In order to take account of different econometric issues, such as endogeneity, country specific effects and so on, they employed econometric techniques of OLS, fixed effects, system GMM and instrumental variables in their analysis. They contended that debt has a nonlinear effect on economic growth. In addition, their results revealed that debt begins to impact growth negatively as soon as debt levels exceed 160% to 170% of exports and 35% to 40% of GDP. The results also suggested that doubling debt in these countries leads to a slowdown of per capita growth by about half to a full percentage point. In a similar study for eighty-seven developing countries, Imbs and Ranciere (2005:15) employed OLS, fixed effects and system GMM in an analysis of the debt overhang issue. They argued that the debt-growth nexus in the sampled countries follows a nonlinear pattern and that the negative effect of debt on growth takes effect as soon as debt levels reach 60% of GDP or 200% of exports. Moreover, out of the eighty-seven countries under study, they discover thirty-seven cases of debt overhang, out of which twenty-three were in Africa, while twelve and two were in Latin America and Asia, respectively. What is more, Smyth and Hsing (1995:54) investigated whether an optimal debt ratio existed in the relationship between debt and economic growth in the US for the period 1960 to 1991. The result of their analysis indicated that economic growth and debt, alongside other determinants of growth in the model had a long-run stable association, and that debt-to-GDP ratio of 38.4% corresponded to maximum growth for the economy.

Meanwhile, an interesting study on the existence or otherwise of an optimal debt level has been carried out by Schclarek (2004:15) who employed the system GMM technique on panel data from fifty-nine developing and twenty-four industrial countries for the period 1970 to 2002. The estimation results rejected the existence of an inverted U-shaped relationship between external

debt and economic growth, as suggested by the nonlinearity argument. Specifically, Schclarek found a negative relationship between external debt and economic growth in developing countries, with the negative relationship being driven by public, rather than private external debt. In the case of the industrial countries, the study found the relationship between debt and economic growth to be insignificant. In a related study, Schclarek and Ramon-Ballester (2005:13) examined the link between total external debt and economic growth for twenty Latin American and Caribbean countries from 1970 to 2002. They discovered that the relationship between total external debt and economic growth was significant and negative. According to the study, while the negative relationship emanated from a high level of public external debt, the high level of private external debt is not related to the slump in economic growth.

Nevertheless, the results of the abovementioned were sharply rejected by Caner *et al.* (2010:5) who, in a similar study, also investigated developing and industrial countries on whether a threshold beyond which debt harms growth exists. A total of seventy-five developing and twenty-six industrialised countries, with panel data from 1980 to 2008, were included in the study and a least squares threshold regression was employed for the analysis. The results of this study established that the debt-growth relationship in the said countries followed a nonlinear pattern and that a debt threshold of around 77% debt-to-GDP ratio existed, beyond which additional debt depressed growth. Moreover, in an analysis of how external debt affects growth in low-income countries, Clements and Krolzig (2003:207) argued that the relationship between debt and growth is nonlinear and in form of an inverted U-shape. In addition, they identified the optimal debt level of 30 to 37 percent of GDP and 115 to 120 percent of exports, beyond which debt becomes detrimental to growth.

A very important contribution concerning the nonlinear effect of debt on growth is made in a polemical article by Reinhart and Rogoff (2010:575) who employed data spanning two hundred years gathered from forty-four advanced and emerging economies. Their results revealed that the impact of debt on growth is low for a debt-to-GDP ratio below 90% of GDP, but above this threshold, average growth rates fall by about 1%. They further declared that the threshold is lower for emerging countries at 60% of GDP, above which growth falls by 2%. The threshold result in this article was analysed in a similar study by Minea and Parent (2012:14). By investigating the same panel of countries, excluding the period 1880-2009, their estimations reveal that although

higher levels of debt are harmful to growth for debt ratios below the 90%, this adverse effect reduces as debt increases. They also identified a turning point of 115% debt-to-GDP ratio and argued that public debt positively affects growth below this threshold, but influences it negatively, above the threshold.

Meanwhile, by way of critique, the seminal work by Reinhart and Rogoff (2010) was replicated for the period 1790-2009 by Herndon *et al.* (2014:257). Following their analysis, they rejected the conclusion that debt depresses growth once the 90% of GDP debt threshold is exceeded. For them, there were no noticeable differences in the rate of growth for debt/GDP ratios below and above 90%. Instead, they asserted that the link between debt and growth differs substantially by period and country. Further to this, they (Herndon *et al.*, 2014:257) averred that in Reinhart's and Rogoff's (2010) estimations, selective exclusion of available data, coding errors and inappropriate weighting of summary statistics led to miscalculations that portrayed the link between debt and growth incorrectly. There are several other research contributions in response to this originative article. One of these is a rejection of this finding for the United States by Nersisyan and Wray (2010:20) who argued that Reinhart's and Rogoff's results were not relevant to the case of the United States. Additionally, by putting a variant of their dataset to threshold analysis in a general multivariate growth framework, Egert (2013:3) reported that a negative nonlinear relationship exists between debt and economic growth. However, the threshold of public debt in this case was estimated to fall between 20% and 60% of GDP.

In the meantime, a similar type of study was carried out solely for developing countries. Using the GMM technique on panel data from ninety-two low- and middle-income economies ranging over the period 1970 to 2007, Presbitero (2010:9) demonstrated that debt affects economic growth negatively up to a turning point of 90% debt-GDP ratio, beyond which it becomes ineffectual. This result was rejected in a much more recent investigation, also undertaken for developing countries, on the relationship between public debt and economic growth. With panel data from 15 countries covering the period 1985 to 2013, Nhu *et al.* (2016:10) used threshold regression to establish that at low levels, public debt affects economic growth positively, whereas beyond a certain threshold, the effect becomes negative. The study estimates this threshold to be between 13% and 39% of debt-to-GDP ratio for the case of developing countries.

In another interesting study on whether a particular threshold exists in the debt-growth relationship, Pescatori *et al.* (2014:14) used an extensive dataset in a case of advanced economies and concluded that there is no evidence of any certain debt threshold beyond which economic growth is hampered. They did however report some evidence of higher levels of debt being associated with higher degrees of output volatility. Reinhart *et al.* (2012:22) also analysed the major debt overhang sequences in the developed countries since the early 1800s in a follow up study to their 2010 article. They argued that the developed countries suffer from both public and private debt overhangs and that they had already exceeded their critical 90% debt-to-GDP threshold. Of the twenty-six episodes of public debt overhang identified, growth was lower by an average of about 1.2%. They also claimed that in many of the debt overhang episodes, the negative effect of high public debt on growth is not transmitted solely through high real interest rate.

From the financial sector perspective, an investigation of whether a turning point exists, above which financial development no longer has a positive effect on growth was conducted by Arcand *et al.* (2012:22). Using cross-section data for forty-four developed and emerging market economies over the period 1976 to 2005, they concluded that finance starts affecting output growth negatively as soon as private sector credit surpasses the 104% to 110% of the GDP benchmark, and that the negative effect is worst for credit over 160% of GDP. Reinhart and Rogoff (2011:1702) also analysed the links between debt cycles and the recurrent pattern of banking and sovereign debts. They cautioned that banking crises enhance the possibility of a sovereign debt default.

Moreover, a stochastic frontier model was employed by Drine and Nabi (2010:493) to examine the impact of external debt on efficiency of output for twenty-seven developing countries covering the period 1970 to 2005. The results of the analysis confirmed that external debt has a nonlinear effect on production efficiency, with a threshold of about 84%. A nonlinear effect of external debt on the formal sector was also confirmed by the study. Furthermore, in a bid to empirically determine the turning point beyond which debt becomes deleterious to economic growth for eighteen OECD countries, Cechetti *et al.* (2011:17-18) investigated government, corporate and household debts respectively vis-à-vis economic growth, aided by correlations and standard panel growth regressions and data covering the period 1980 to 2010. Based on this analysis, it was asserted that debt depresses growth when it exceeds a threshold of 85% of GDP for government/household debts and 90% of GDP for corporate debt.

Akin to this, by focusing on twelve Euro area countries, Checherita-Westphal and Rother (2012:1395-1402) investigated the impact of government debt on per capita GDP growth between 1970 and 2010. Applying fixed effects panel estimations, they concluded that the relationship between debt and growth follows a nonlinear pattern, with a threshold of between 90% and 100% of the debt-to-GDP ratio. Moreover, the confidence intervals in the estimation even suggested that the adverse effect of high debt on growth may already start from levels of about 70% to 80% of debt-to-GDP ratio. In another study on the twelve Euro area countries, a dynamic threshold methodology with panel data from 1990 to 2010 was employed by Baum *et al.* (2012:2). Their findings reveal that the short-run effect of debt on economic growth is positive but reduces to around zero when the debt-to-GDP ratio exceeds a threshold of approximately 67%. It was also established that for debt ratios above 95% of GDP, additional debt affects economic activity negatively. They further maintained that the long-term interest rate is subject to increased pressure as soon as debt-to-GDP ratio exceeds 70%.

A more recent study was been carried out across the Euro area countries by way of time series analysis for each of the eleven EMU countries in the study for the period 1961-2015. By applying the two-stage least squares regression, Gomez-Puig and Sosvilla-Rivero (2017:478) reported that apart from Belgium, an increase in debt stock begins affecting growth negatively, well before reaching the Stability and Growth Pact (SPG)'s debt ceiling of around 40% and 50% in the central and peripheral countries, respectively, and that debt reduction yielded no noticeable benefit concerning the countries' economic performances. More importantly, they determined that the negative impact of debt on growth did not occur beyond the same turning point and with the same intensity in all the countries.

By focusing on 38 advanced and emerging market economies with populations higher than five million each, Kumar and Woo (2010:16) investigated the debt overhang hypothesis utilising panel data from the period 1970 to 2007. The study adapted endogenous growth models to estimate the effect of initial gross public debt on subsequent long-run growth of real GDP per capita - the results of which indicated that a negative relationship exists between initial debt and subsequent growth. The study also established that there is a nonlinear association between debt and growth, with the debt threshold standing at 90% of GDP, above which debt affects growth adversely. Another study that supported a nonlinear relationship between debt and growth was carried out by Pattillo *et al*.

(2011:25) who focussed on the impact of both public and private external debt on the economic growth for ninety-three developing countries across all regions of the world. Applying the technique of GMM on panel data for the period 1969-1998, their estimations indicated that an inverted U-shaped relationship exists between external debt and economic growth in the sampled countries. They also identified the turning points beyond which debt becomes deleterious to growth in terms of debt-to-GPD and debt-to-exports ratios: 35-40 percent for the former and 160-170 percent for the latter.

Additionally, the relationship between external indebtedness and growth variables was examined in the case of Turkey, extending from 1974 to 2009. Using the Markov-switching model, Dogan and Bilgili (2014:216) discovered that the main growth variables such as investment and human capital affect growth positively. They also distinguished between public and private external debts in their study and concluded that both affect growth negatively in regime at zero, and regime at one. However, they argued that the adverse impact of public external debt on growth and development is greater than that of private external debt. They concluded that the relationship between debt variables and economic development follows a nonlinear path. In another interesting study by Mariano and Villanueva (2006:1) in which the basic principles underlying the interactions between the Neo-Classical Growth Model, external debt and economic growth were considered for a closed economy in East Asia. Results from their estimations revealed that external debt affects economic growth through a linear effect from interest rates and a nonlinear effect from capital accumulation. Based on their nonlinear analysis, they asserted that as the GDP and export reach a defined high level, the increase of GDP and export contribute significantly to reducing the burden of external debt.

On top of that, Lopes da Veiga *et al.* (2014:9) examined the significance of public debt on economic growth and inflation for a group of fifty-two African countries within a panel framework. They reported that the association between public debt and growth follows a nonlinear pattern with an inverted U-shape relationship in the sample of countries. A threshold of 60% of debt/real GDP ratio and an average inflation rate of 8.2%, beyond which economic growth begins to experience a slowdown, was also identified in their estimations. For the entire sample, they concluded that rising levels of inflation and high stock of public debt are associated with declining growth rates. Panel estimations were also conducted for 3 specific geographical areas within the

sample of countries: The North African, the sub-Saharan African and the Southern African Development Community (SADC) countries, and the results from each of these three geographical areas corresponded to the overall result. Similarly, using the OLS technique in a panel study involving a sample of seventy-nine developing countries for the period 1970 to 2002, Cordella *et al*. (2005:21) stated that a moderate relationship could be found between debt and economic growth at the intermediate level, but that the same could not be said of the lower levels. They also found that debt overhang holds its sway in those countries that have good governance and strong institutions as soon as debt stock exceeds the 15-30% debt/GDP ratio threshold, while the effect becomes irrelevant when the stock of debt reaches 70-80% of GDP.

By focusing on a large panel of countries comprising one hundred and eighteen developing, emerging and advanced economies over the period 1960 to 2012, Eberhardt and Presbitero (2015:8) examined the relationship between debt and long-run growth, using the error correction model for the linear and nonlinear specifications in the analysis. The results from their estimations revealed that an inverse relationship existed between debt and long-run growth among countries in the sample, but that the debt thresholds differed amongst them. In another interesting study on whether the relationship between public debt and growth is nonlinear, and if there is indeed a debt threshold beyond which debt depresses growth, Kourtellos *et al*. (2013:35) used a structural threshold regression for a case of eighty-two countries with a balanced ten-year period panel dataset for the periods 1980 to 1989, 1990 to 1999 and 2000 to 2009. From their estimations, they found little evidence for such nonlinear relationships, but instead, they discovered that the relation between debt and growth was critically affected by the quality of institutions accessible in each country.

3.3.3 Relationship between debt and growth: channels of transmission

There is a growing concern amongst researchers and policy makers concerning the channels through which the deleterious effect of debt is transmitted into the economy. They have also been concerned about whether the nonlinear effect of debt on growth is also obtainable in the association between debt and other factors that affect growth. There are, however, a limited quantity of research works on the channels of transmission in the relationship between debt and economic growth, especially as it concerns the developing countries.

As referred to earlier in this chapter, in exploring the link between debt and growth for fifty-nine developing and twenty-four industrial economies, Schclarek (2004:8) employed the system GMM econometric technique and panel data between the years 1970 and 2002. Results from their estimations indicated that debt accumulation affects growth primarily through capital accumulation growth, while there was limited evidence on external debt affecting growth through total factor productivity growth. Moreover, mixed results were generated in the case for private savings rates as a channel of transmission between debt and growth. The estimations also rejected the claim of a concave relationship between external debt and economic growth, while no significant relationship was found between debt and growth for industrial countries. In a similar type of study, Pattillo *et al*. (2004:15) used the OLS, Instrumental Variable, Fixed Effects, differenced GMM and system GMM approaches within a Growth Accounting framework to analyse the channels through which debt affects growth for sixty-one developing countries, with panel data covering the period 1969 to 1998. From the results of their analysis, they concluded that high debt affects economic growth negatively via the channels of physical capital accumulation and total factor productivity growth. They further claimed that almost one-third of the negative effect of debt on growth occurs through the channel of physical capital accumulation, while about two-thirds occur through the channel of total factor productivity growth.

Furthermore, an examination of the average impact of debt on per capita GDP growth was carried out by Checherita-Westphal and Rother (2012:1395-1402) for twelve Euro area countries over a period of almost 40 years starting in 1970. Using dynamic panel models, they concluded that the channels through which debt affects growth are private saving, total factor productivity, public investment and sovereign long-term nominal and real interest rates. In the meantime, however, the claim that savings and interest rate are channels through which debt affects economic growth was rejected in another, later study by Riffat and Munir (2015:21) for four Asian countries covering the period 1991 to 2013. Estimation results from the Fixed Effect technique employed show that the channels through which debt negatively affects growth are private investment, public investment and total factor productivity. In their estimations, savings and interest rate fail to be significant channels of transmission between debt and growth. In addition, they also claim that the relationship between debt and growth in the South Asian countries is nonlinear.

Also, by focusing on fifty-five low-income countries between 1970 and 1999, the channels through which external debt affects economic growth were investigated by Clements *et al*. (2003:15). Using the econometric techniques of Fixed Effects and system GMM, they reported that external debt negatively affects growth through its adverse impact on public investment. Their estimations also confirmed the existence of debt overhang and the nonlinear effect of debt on growth in the sample of countries. Moreover, in a study of the channels through which debt affects growth in thirty-eight advanced and emerging economies for the period 1970-2007, Kumar and Woo (2010:16-18) employed pooled OLS, Between Estimator, Fixed Effects and system GMM. From their estimated results, they concluded that a negative relationship between debt and growth is mostly explained by a decrease in labour productivity growth which is in turn caused by a decline in investments and in growth of capital stock. On top of that, in a panel study of seventeen Asian countries regarding the relationship between external debt and economic growth between 1988 and 2006, Lau and Kon (2014:2172) employed panel cointegration and Granger causality techniques and concluded that external debt transmits its impacts into the economy through two channels. First, directly from external debt to GDP, and second, indirectly, in which case it affects exports positively through GDP.

Furthermore, a number of studies have investigated the debt-growth nexus through its relationship with investment. In one of these studies, Borensztein (1990:333) used numerical simulations of a rational expectations growth model for a heavily indebted country and argued that past accumulated debts lead to debt overhang and that credit rationing may be a major discouragement to investment. Similarly, by investigating the investment experience of thirteen heavily indebted economies between 1971 and 1991, the debt overhang hypothesis was explored by Deshpande (1997:183-185). Using the Fixed Effects approach, he discovered that the relationship between external debt and investment was consistently negative. Additionally, his analysis revealed that investment is affected by external debt in as many as ways as other determinants of investment affect it, especially in economies suffering from debt overhang.

In another study based on policy simulation, Fosu (1999:308) examined the effect of external debt on economic growth for SSA countries between 1970 and 1994 by. By using a macroeconomic model, he suggested that accumulated external debt reduces investment via two avenues: disincentive and crowding-out effects. He also claimed that a 20% reduction in the level of external

debt would have enhanced investment by 18% and economic growth by 1%, on average. Still on African countries, Fosu (1996:104) investigated the impact of debt on growth for twenty-nine SSA countries utilising the OLS approach, and using panel data covering the period 1970 to 1986. He reported that debt accumulation has generally had an adverse impact on economic growth in the region. Furthermore, he averred that although the impact of debt on the level of investment is rather weak, it is obvious that it negatively affects the nature, and consequently, the productivity of investment undertaken. He also concluded that the relationship between debt and investment is nonlinear: positive at low levels of investment, and negative beyond a 16% GDI/GDP turning point. Meanwhile, in opposition to these findings that indicate investment as a channel between debt and growth, a panel study for ninety-three developing countries that cut across sub-Saharan Africa, Asia, Latin America and Middle East was conducted by Pattillo *et al*. (2011:26) over the period 1969 to 1998. Findings from their Fixed Effects and system GMM estimations meant that they rejected the claim that investment is the main channel through which external debt transmits a negative impact into the economy.

After examining annual data from Nigeria, spanning 1970 to 2001 and in a bid to analyse the relationship between external debt, foreign direct investment and economic growth in the country, Ezirim *et al.* (2006:37) revealed that there was a dual causal relationship between external debt burden and foreign direct investment in the country. Moreover, results from the least squares and fully modified Philips-Hansen techniques employed in the study indicated that neither the external debt burden nor the foreign direct investment had a significant impact on the growth of output levels in Nigeria. Continuing with research on Nigeria, a study on causality between external debt and foreign private investment between 1970 and 2003 was conducted by Ajisafe *et al.* (2006:56). Results from the vector autoregressive model in the study indicated that a bi-directional causality exists between external debt and foreign private investment in the country.

Meanwhile, an attempt is made to determine whether debt crisis causes a decline in investment by Warner (1992:1176). By using panel data and least squares regression for thirteen HIPCs, he rejected the claim that the debt crisis is mainly responsible for the decline in investment for the sample of countries examined. This research work was also extended to Mexico by Iscan (1998:1) by seeking to determine the extent to which financing constraints affect investment levels after the international debt crisis which started in 1982. By utilising a cost-of-adjustment model of

investment and panel data of the Mexican manufacturing industry from 1970 to 1990, they discovered that financing constraints partly account for the impact of the debt crisis on investment. Apart from that, the crowding-out effect in the relationship between debt and investment was rejected by Majumder (2007). By employing the error correction model for an investment function with public debt, interest rate and GDP as the independent variables for Bangladesh from 1976 to 2006, he reported crowding-in effect rather than crowding-out effect from public debt to investment.

An interesting finding that is in agreement with Warner's (1992) conclusion on the relationship between debt and investment can be found in the results of a study by Ezirim *et al.* (2004a:13) who attempted to analyse the credibility or otherwise of the long-standing argument that external debt burden depresses investment in less developed countries, based on evidence from Nigeria. By comparing different model estimations from a number of estimation techniques, with data covering 1970 to 2001, they submitted that neither external debt stock nor debt service would inevitably discourage domestic investment. Further, they posited that debt service enhances domestic investment in Nigeria. This position was corroborated by the submission in a previous study by Elbadawi *et al*. (1997:57) who found that debt service payments by developing countries do not always depress investment; however, it completely disagreed with the conclusions reached by Savvides (1992:375-377) and Levy and Chowdhury (1993:115) that debt service crowds out investment in less developed countries.

3.3.4 Relationship between institutional quality and economic growth

So far, several studies have been conducted concerning the way in which institutions affect the performance of the economy, especially in relation to economic growth. In an investigation into why many less developed countries (LDCs) suffered immense volatility and so many crises during the post-war period, the technique of two-stage least squares was employed by Acemoglu *et al.* (2003:105) and they reported that weak institutions were responsible for volatility through certain microeconomic and macroeconomic channels. They also concluded that the effects of institutional differences on volatility did not seem to primarily come from any of the standard macroeconomic variables.

Moreover, an enquiry into the role of institutions and geography in the reversal of economic fortunes of colonised countries which were relatively rich before the colonisation, but are now experiencing downturn in economic fortunes was carried out by Acemoglu *et al.* (2002:1231). In their comparative analysis, they submit that institutions, not geography, are responsible for the reversal of fortunes in such countries, and that geography has just an indirect effect on the economy through institutions. They therefore, concluded that reversals in institutions in these countries were mainly responsible for the reversal of economic fortune experienced in the countries.

Furthermore, when investigating the relationship between institutions and long-run growth, Acemoglu *et al.* (2005:462) used historical and comparative analyses, as well as theoretical arguments to show that differences in economic development among nations of the world are caused by differences in economic institutions in the countries. This argument has been affirmed by another study by Acemoglu and Robinson (2008:25) who asserted that the primary factor determining different growth levels among countries is divergence in the quality of institutions and that solving an economy's developmental problems requires an understanding of what it takes to push the country from a bad to a good political equilibrium. Moreover, by using the OLS and Instrumental Variable econometric techniques in a study involving a sample of one hundred and thirty-seven countries, Rodrik *et al*. (2004:137) examined the individual contributions of institutions, geography and trade in shaping the level of growth around the world. From their estimations, institutions turn out to be the main determinant of income levels relative to the two other variables. Specifically, they report that once institutions are controlled for in the models, geography only appears to have weak direct impact on income levels while its indirect impact is strong due to its effect on institutional quality. In the case of trade, they claim that it hardly has any effect on the levels of income around the world.

In an examination of about one hundred and fifty-five economies around the world, the role that institutions play in engendering potential gains from trade was investigated by Bormann *et al*. (2006:360). By employing the OLS and instrumental variable techniques, they submit that institutional quality plays a crucial role in trade liberalisation. They also identified the regulatory quality as the most important aspect of institutional quality that matters most for the positive relationship between trade and growth. Furthermore, their result showed a positive relationship between trade and income levels for countries with high scores in institutional quality indicators,

while it indicated a negative relationship in the case of countries with low scores. Similarly, the impact of institutions and trade on economic growth were investigated by Dollar and Kraay (2002:25). By applying the OLS and instrumental variable on cross-country regressions, they argued that over the long run, both trade and institutions exert substantial impact on growth. In particular, they claimed that both variables are critical in understanding cross-country differences in growth rates amongst countries. For the short run, however, they argued that trade is relatively more important in explaining differences in growth rates across countries.

In other research, a sample of one hundred and fifteen industrial and developing countries worldwide were investigated concerning the role of institutions in the adoption of counter-cyclical macroeconomic policies by Calderon *et al*. (2012:1). With the use of GMM with fixed effects for dynamic panel models, they concluded that the level of institutional quality plays an important role in the ability of a country to implement counter-cyclical macroeconomic policies. Moreover, in an attempt to develop a conceptual model that exemplifies the link between institutions and economic development, Vitola and Senfelde (2015:277) employed qualitative approaches of synthesis and deduction, as well as logical and comparative analyses of the literature. Their analysis indicated that institutions play a crucial role in aiding technological progress and guiding the world into the modern economic regime. It further indicated that institutions significantly affect socioeconomic development around the world. In addition, in an investigation into why some countries produce a much greater average output than others, Hall and Jones (1999:114) used the instrumental variable approach in substantiating that this could be wholly explained by differences in social infrastructure, comprising institutions and government policies.

Furthermore, by investigating a large sample of countries in an enquiry as to why so many countries have witnessed a slowdown in growth since the mid-1970s, Rodrik (1998:12) argued that the quality of institutions is an important determinant of growth. Findings from his econometric estimations indicated that countries with divided societies and inadequate institutions witnessed the worst downturns in economic growth after 1975. In similar vein, the relationship between institutional quality and economic growth was explored in a case involving data gathered from a large sample of Latin American countries focussing on the period between 1970 to 1990 by Chong and Zanforlin (2001:22). By using panel data regression by way of OLS, they posit that good institutions, good policies and good governance are linked with higher rates of economic

growth. Another important finding from the analysis was a rejection of the argument that the duration of either autocratic regimes or groups have a positive impact on good governance and good policies as claimed by Clague *et al.* (1996:243) in a similar study that also focussed on Latin American countries.

By focusing on China, panel data for thirty-one provinces was employed by Hasan *et al.* (2009:167) to analyse the effect of legal institutions, financial deepening and political pluralism on growth rates in the country between 1986 and 2002. Results from the two-stage GMM employed in the study recorded that the development of financial markets, the legal environment, awareness of property rights and political pluralism have a positive impact on economic growth in the country. Similarly, the OLS method and factor analysis were employed to consider the link between institutions, governance structure and economic performance for Nigeria from 1970 to 2011 by Udah and Ayara (2014:16) who highlight governance structure and institutional quality as crucial factors for improved economic performance.

Conversely, the relevance of institutions to economic performance was played down in an investigation by Iyoboyi and Pedro (2014:1) who examined the impact of institutional capacity on macroeconomic performance for Nigeria. Using a VECM for the analysis, they reported that the impact of institutional capacity on macroeconomic performance was negative. What is more, estimates of the variance decomposition showed that institutional capacity changes do not impact the country's macroeconomic performance. However, by using the cointegration approach to consider the effect of institutional and policy environments on industrialisation in Nigeria, a long-run association was found between institutional environment and industrialisation by Iyoboyi *et al.* (2016:21). They also opined that institutional and policy environments are vital to industrialisation in Nigeria. Their claim was supported by Alexiou *et al.* (2014:134) who employed the ARDL bound-testing approach to explore the link between institutional quality and growth as well as other key economic variables for Sudan. They concluded that the institutional environment is one of the most crucial factors affecting the country's economic performance.

Notably, an important contribution was made by Marakbi and Turcu (2016:1) to the issue of the link between institutional quality and economic growth in their estimation of the nonlinear effect of corruption and institutional quality on economic growth for one hundred and twenty-eight

countries, comprising both developed and developing economies. By employing the panel STR framework, they found that the relationship between corruption and economic growth follows a nonlinear path. Specifically, they opined that corruption affects growth positively (negatively) in countries with low (high) level of institutional development. Likewise, by focusing on thirty-eight developing countries, Aynur and Gokalp (2016:354) used panel data to explore the relationship between institutions and macroeconomic performance. Their estimations provided evidence that some institutional structural indicators have positive impacts on macroeconomic performance, while others have negative impacts on macroeconomic performance of developing countries.

Along the same line, Dawson (1998:616) considered the alternative channels through which institutions transmit their impacts into the economy within the framework of the neoclassical growth model. Using the OLS and three-stage least squares regressions and panel data for a large sample of countries from 1975 to 1990, he concluded that economic freedom has a positive effect on economic growth, and that this positive effect is transmitted through both a direct impact on total factor productivity and an indirect impact on investment. He further suggested that political and civil liberties have no impact on growth, but that there is mixed evidence that they may have an effect on investment. In a much earlier study, Scully (1988:658) focussed on a sample of one hundred and fifteen countries from 1960 to 1980 to determine the role of institutions in economic development. His results revealed a positive relationship between the level of economic freedom and economic growth. Moreover, a similar result is also reported by Kormendi and Meguire (1985:1) who estimate the effect of civil liberties on economic performance and investment for a sample of forty-seven economies between 1950 and 1977. Based on the results of their analysis, they documented that civil liberties have a marginal effect on growth and a dramatic effect on investment.

As regards the link between democracy and growth, Decker and Lim (2008:708) broke down institutional quality into political-economic institutions and political institutions of democratic development to investigate the institutional quality-growth link for a sample of ninety-one countries by employing the econometric techniques of OLS, two-stage least squares and system GMM. Findings from their estimations indicated that democracy had no effect on growth as the results showed no evidence that democratic countries grow faster or slower than non-democratic

countries. On the other hand, political-economic institutions were documented as having positive impact on economic growth.

3.3.5 Role of institutional quality in external debt-economic growth nexus

While substantial efforts have been put into investigating the debt-growth nexus on one hand and the institutional quality-growth nexus on the other hand, more recent research has also concentrated on examining the impact of institutional quality on the relationship between debt and growth. An investigation into how the relationship between debt and growth varies with different indebtedness levels and other country characteristics was conducted by Cordella *et al*. (2005:17) in a panel study for seventy-nine developing countries from 1970 to 2002. Results from both OLS and system GMM techniques employed in the study provided evidence that countries with good policies and institutions experience debt overhang at debt levels beyond 15% -30% of GDP, while the marginal effect of debt on growth becomes ineffectual at debt levels above 70%-80%. On the other hand, the effect of debt overhang and irrelevant thresholds were found to be lower in the case of countries with poor policies and institutions. In similar vein, an investigation of the debt overhang hypothesis was conducted among eighty-seven developing countries by Imbs and Ranciere (2005:20) over the period 1969 to 2002 by using the OLS, fixed effects and GMM techniques. Based on the analysis, they documented that institutional quality indicators of government effectiveness, rule of law and bureaucratic quality help to restrain external debt accumulation, while also enhancing economic growth. It is also found that in cases where debt overhang holds sway, there is a collapse of investment and a deterioration in the conduct of economic policy.

An important contribution was also made by an investigation into the role of institutional quality in the government debt-economic growth nexus for Malaysia by Daud and Podivinsky (2014:1182). By employing time series data from 1970 to 2011 and the threshold method by Hansen (2000), they reported the significance of the contingency effect of institutional quality in the relationship between government debt and economic growth. In particular, they posited that Malaysia needs to attain some minimum threshold of institutional quality for government debt to be beneficial to the economy. Moreover, the Ramsey-Cass-Koopmans growth model was extended by Qayyum *et al.* (2014:47-48) to examine the impact of foreign aid, external debt and governance

on economic growth in an open economy. By augmenting the model with foreign aid, external debt and governance, the results from the subsequent model calibration indicated that for developing countries to attain the considerable rates of growth required, they must institute impartial and consistent sets of rules that ensures a high quality of governance, while they should source their budgeting funds more from foreign aids, rather than from external debts, as the latter is found to exert an adverse effect on growth.

Furthermore, by focusing on the role of policy and institutional framework in the link between external debt and economic growth for a sample of one hundred and fourteen developing countries between 1980 and 2004, Presbitero (2008:4) reports that the nature of the link between external debt and economic growth depends on the quality of institutions and policies in place. Specifically, results from the system GMM estimations conducted in the study indicated that external debt has no relevance for countries with weak institutions, while for countries with sound institutions, the Debt-Laffer curve was found to lose statistical significance for countries, after institutional quality is controlled for. Similarly, the impact of external debt and institutional quality on economic growth was analysed for a sample of 6 West African Economic and Monetary Union (WAEMU) countries by Ouedraogo (2015:139) who employed the error correction model (ECM). Results from his estimations indicated that institutional quality indicators, such as corruption control, government stability and bridling the influence of the military and religion in politics all contribute positively to bolstering economic growth and development. The relationship between external debt and economic growth was also found to follow a nonlinear path, with the external debt threshold estimated to be 51% of GDP, beyond which external debt becomes deleterious to economic growth.

While most research on debt-institutional quality nexus hold that institutional quality affects the performance of external debt one way or the other, there are other studies that claim that the nature of the relationship works in the opposite direction. One such study is by Moss and Chiang (2003:11) which aimed to analyse the cost of accumulated external debts for low-income economies. From their analysis, they found that high debt contributes significantly to rendering economic reforms ineffectual and also places a heavy administrative burden on states, thereby worsening the problem of institutional capacity constraints and slowing down the development of institutions. Their analysis also suggested a likely association between debt levels and economic

growth, but the nature of the relationship remains inexact. Furthermore, in order to investigate whether debt reliefs granted the HIPCs in the last fifteen years had been motivated by economic issues, the determinants of debt relief for one hundred and twenty-three countries were analysed by Freytag and Pehnelt (2008:77) for the period 1990 to 2004. Based on the results of their analysis, they documented that the actual debt burden of the indebted countries was not an essential factor in the determination of whether or not debt relief would be granted to individual debtor countries. However, they were of the opinion that this approach changed at the beginning of the 21st century when the donor countries started considering some dimension of governance quality in taking such decisions. This position corroborates a previous finding by Alesina and Weder (2002:1135) who deny the existence of an inverse relation between corruption and foreign aid/debt relief for the period 1970 to 1995. They contended that corrupt governments who had inadequate policies still attracted a similar amount of foreign aid and debt relief, compared to their less corrupt counterparts, during the period under study.

An interesting contribution was also made regarding the impact of institutional quality on the economy through its effect on firms' choice between private and public debt and the subsequent financing costs. By using data on new debt issues by firms in twenty-six non-US countries between the years of 1995 to 2008, Zhang *et al.* (2016:263) evidenced that vital institutional factors such as creditor rights protection, legal enforcement and financial transparency affect firms' debt choice in both domestic and international debt markets. Similarly, a study aimed at comparing the capital structure debt maturity choices among firms was carried out by Fan *et al.* (2012:23) who asserted that in countries with weak laws and weak enforcement of creditors' rights, firms resort to reliance on debt choices that limit managerial discretion. In the case of countries with strong laws and strong enforcement of creditors' rights, they posited that monitoring by private lenders is less common.

Furthermore, an attempt is made by Kaminsky and Pereira (1996:1) to re-examine the hypothesis from the debt overhang literature that debt crisis was responsible for the breakdown of economic growth of the Latin American debtor countries in the 1980s. By simulating an endogenous growth model and calibrating the same to resemble the economies of Argentina and Mexico, they investigated the dynamic effect of the debt crisis on consumption, growth and investment. From the findings of their analysis, they found the effects of social inequality on government policy and

consumption to be crucial in determining whether the burden of debt servicing affects investment and output or not. Moreover, the relevance of institutions and policies was emphasised in a study on the causes of differences in debt distress among countries by Kraay and Nehru (2003:22) who employed probit regressions to confirm that the quality of institutions and policies is one of the major factors responsible for the said differences. Two other factors named in the study were debt burden and shocks. By using the structural threshold regression in a case of eighty-two countries over three 10 year periods covering 1980 to 1989, 1990 to 1999 and 2000 to 2009, the impact of public debt on growth was analysed by Kourtellos *et al*. (2013:42). Results from their estimations do not support the existence of nonlinearities in the link between debt and growth as predominantly suggested in the literature. Rather, they concluded that the relationship between debt and growth is moderated by the quality of institutions in a country. Specifically, they noted that debt depresses growth in countries where the level of institutional quality is below a particular threshold, while debt is growth-neutral in economies with a sufficiently high quality of institutions.

Besides, Edet-Nkpubre (2013:61) analysed the relationship between external debt management, institutions and economic growth by considering the various results and approaches employed in previous related studies. The findings from his analysis led him to the conclusion that institutional quality plays a crucial role in determining how external debt affects economic growth in a country. Against the backdrop of the fact that with a good public debt management programme in place, a country can reduce its debt management cost and contain its financial risks, Melecky (2012:232) used survey data on debt management strategies from the World Bank to investigate whether a country's debt management scheme is affected by democratic accountability, institutional quality and past debt crises. Using logit regression for a sample of one hundred and seven countries, he reported that institutional quality and democratic accountability could have a substantial impact on whether a developing country has a transparent and accountable debt management strategy or not. Moreover, in an attempt to examine the issue of management and sustainability of external debt in Africa, Muhanji and Ojah (2011:199) used large panel data from African, East Asian and Latin American countries from 1970 to 2008. Results from the fixed effects regression in the study confirmed that African countries would have to follow the lofty guidelines employed by the East Asian countries for them to efficiently manage their debts. The study also revealed that political stability and effective legal institutions are critical to attaining the objective of external debt reduction for African countries.

Tables 3.1 to 3.5 below present a synopsis of the reviewed empirical studies.

Table 3.1: Summary of studies on linear relationship between external debt and economic growth

Author(s)	Subject	Period	Countries	Methodology	Results
Ajayi & Oke (2012:302)	Effect of external debt burden on growth and development	1970-2000	Nigeria	OLS	External debt burden affects national income and other macroeconomic indicators negatively
Balassoni *et al.* (2011:12-15)	Differences in the effects of domestic and external debts on economic growth	1861-2010	Italy	Endogenous growth model regression	External debt played a greater role in the stronger negative impact of debt on growth before 1914
Chowdhury (1994:1129)	Relationship between external debt and economic growth	1970-1988	10 Asian and Pacific countries	Granger causality and 3SLS	External debt neither depresses nor enhances economic growth
Clements, Bhattacharya and Nguyen (2003:18)	Interaction between external debt, public investment and growth	1970-1999	55 low-income countries	Fixed effects and system GMM	-High debt stock constitute a drag on growth -External debt affects growth indirectly via investment
Clements, Bhattacharya and Nguyen (2005:16)	Effects of debt burden on public investment	1970-2002	55 low-income countries	System GMM	-Huge debt stocks have not seriously hampered public investment -Debt relief has only resulted in more consumption, rather than in greater investments
Colombo & Longini (2009:12)	Determinants of long-term external debt	1970-2000	61 Developing countries	Pooled OLS	The relationship between external debt, output level and trade openness is positive and strong
Desphande (1997:169)	Exploration of the debt overhang hypothesis	1971-1991	13 heavily indebted countries	Fixed effects	-Relationship between external debt and investment is consistently negative -In countries with debt overhang, external debt affects other variables that traditionally explain investment
Easterly (2002:1692)	A review of two decades of debt relief	1980-2000	HIPCs and LDCs	Comparative analysis	Trends of terms of trade and wars in HIPCs do not differ from those of non-HIPC LDCs
Eberhardt & Presbitero (2015:12)	Long-run relationship between public debt and economic growth	1961-2012	118 countries	Error correction model	The relationship between public debt and long-run growth is indirect
Egbetunde (2012)	External borrowing-economic growth link	1970-2008	Nigeria	OLS and Cointegration	External debt has a positive effect on economic growth
Elbadawi, Ndulu and	Impact of debt on growth	1970-1994	99 developing countries	Cross-section regression	Debt accumulation depresses growth, while debt stock enhances growth

Author(s)	Subject	Period	Countries	Methodology	Results
Ndung'u (1996:16)					
Fosu (1999:11)	Effect of external debt on economic growth	1980-1990	35 SSA countries	OLS	External debt is harmful to economic growth
Fosu (2008:23)	Effect of debt-servicing constraint on inclusive growth	1975-1994	35 African countries	Seemingly unrelated regression	Debt servicing burden would shift public spending away from health and education sectors, and possibly from public investment
Iyoha (1999:44)	Impact of external debt on economic growth	1971-1994	SSA	2SLS	Excessively high stock of external debt is deleterious to investment and depresses economic growth
Jarayaman & Lau (2008:281)	Relationship between external debt and economic growth	1988-2004	6 Pacific Island countries	FMOLS	No long-run relationship between external debt and economic growth, but a causal positive linkage from external debt to output exists
Kaminsky & Pereira (1996:21)	A re-examination of the debt overhang hypothesis	1970-1993	Argentina and Mexico	Endogenous growth model simulation	Debt servicing determines investment and growth in the absence of government policy and consumption
Lau & Kon (2014:2173)	Relationship between external debt and economic growth	1988-2006	17 Asian countries	Panel VECM	External debt affects growth positively both directly and indirectly via exports
Mahmoud (2015:5)	The role of external debt on economic growth	1975-2005	Mauritania	Cointegration regression	There is a negative relationship between external debt and growth, but the link between debt servicing and growth is positive
Malik *et al.* (2010:98)	Relationship between external debt and economic growth	1972-2005	Pakistan	OLS	Both external debt and debt servicing have negative effect on economic growth
Metwally & Tamaschke (1994:604)	Link between debt servicing, capital inflows and economic growth	1972-1992	Algeria, Egypt and Morocco	OLS and 2SLS	Capital inflows have a substantial impact on the relationship between debt and growth
Ndikumana & Boyce (2011:167)	Linkage between capital flight and external borrowing	1970-2004	33 SSA countries	Instrumental variable and GMM	SSA countries suffer from debt-fuelled capital flight
Ogunmuyiwa (2011:33)	Relationship between external debt and economic growth	1970-2007	Nigeria	VECM	No causal relationship between external debt and economic growth
Olasode & Babatunde (2016)	Relationship between external debt and economic growth	1984-2012	Nigeria	ARDL	Lag of external debt affects economic growth positively while current year external debt affects it negatively
Olgun *et al.* (1988:13)	Link between external debt, capital inflows, investment and growth	1965-1997	Turkey	2SLS and 3SLS	-Relationship between debt stock and debt service follows a two-way pattern

Author(s)	Subject	Period	Countries	Methodology	Results
					-debt service has no impact on economic growth
Omoju *et al.* (2012:162)	Relationship between external debt and economic growth	197-2007	Nigeria	Granger causality and OLS	-Bi-directional causal relationship exists between external debt and economic growth -External debt negatively affects growth
Panizza & Presbitero (2014:18)	Does public debt have a causal effect on economic growth?	1980-2010	17 OECD countries	Instrumental variable	Public debt may not have a causal effect on economic growth
Siddique *el al.* (2015:18)	To what extent does external debt burden affect growth?	1970-2007	40 HIPCs	Panel ARDL	Reduction in debt stock would substantially enhance the performance of economic growth both in the short run and long run
Tasos (2012:239)	Causality between public debt and growth	1984-2011	China	Granger causality	No causal relationship between debt and growth
Warner (1992:1183)	Effect of debt crisis on investment	1982-1989	13 LDCs	OLS	External debt has no impact on investment
Were (2001:17)	Structure of external debt and its implication for growth	1970-1995	Kenya	Error correction model	-The economy suffers from the problem of debt overhang -debt servicing does not affect growth, but has crowding-out effect on investment
Cui & Gong (2008:1282)	Effects of foreign aid on domestic capital accumulation and external debt	NA	NA	Infinite-horizon model with Marshallian endogenous time preference	-In the long run, increase in foreign aid enhances domestic capital accumulation and consumption but reduces external borrowing -in the short run, increase in foreign aid enhances investment but reduces external borrowing

Table 3.2: Summary of studies on nonlinear analysis in external debt-economic growth nexus

Author(s)	Subject	Period	Countries	Methodology	Results
Baum *et al.* (2012:2)	Impact of debt on economic growth	1990-2010	12 euro area countries	Dynamic threshold regression	Short-run effect of debt on economic growth is positive but reduces to zero when

Author(s)	Subject	Period	Countries	Methodology	Results
					debt/GDP ratio exceeds 67%
Caner *et al.* (2010:5-8)	Debt threshold analysis in the relationship between debt and growth	1980-2008	75 developing and 26 industrialized countries	Least squares threshold regression	-Relationship between debt and growth is nonlinear -There is a debt threshold of 77% of GDP beyond which debt depresses growth
Cechetti *et al.* (2011:17-18)	Determination of debt threshold in Debt-Growth nexus	1980-2010	18 OECD countries	Correlations and standard panel growth regressions	Debt depresses growth when it exceeds a threshold of 85% of GDP for government/household debts and 90% of GDP for corporate debt
Checherita-Westphal & Rother (2012:22-23)	Effect of government debt on per capita GDP growth	1970-2010	12 euro area countries	Fixed effects	Relationship between debt and growth is nonlinear with a debt threshold of between 90% and 100% of debt/GDP
Cordella *et al.* (2005:21-23)	Relationship between debt and growth	1970-2002	79 developing countries	OLS	Moderate relationship exists between debt and growth at the intermediate level, but the same cannot be said of the lower levels
Dogan & Bilgili (2014:216-218)	Relationship between external indebtedness and growth variables	1974-2009	Turkey	Markov-switching model	Growth is positively affected by the main growth variables such as investment and human capital
Drine and Nabi (2010:493)	Effect of external debt on production efficiency	1970-2005	27 developing countries	Stochastic frontier model	External debt has a nonlinear effect on production efficiency, with a threshold of about 84%
Eberhardt and Presbitero (2015:8-12)	Relationship between debt and long-run growth	1960-2012	118 developing, emerging and advanced economies	Error correction model	-Negative relationship between debt and long-run growth across countries -No evidence for a similar debt threshold within countries
Gomez-Puig & Sosvilla-Rivero (2017:478-451)	Threshold analysis in Debt-Growth nexus	1961-2015	11 EMU countries	2SLS	Apart from Belgium, an increase in debt stock begins to affect growth negatively well before reaching the SPG's debt ceiling of about 40% and 50% in central and peripheral countries, respectively
Herndon, Ash & Pollin (2014:21-22)	Nonlinear effect of debt on growth	1790-2009	Advanced and emerging economies	Comparative analysis	-The claim that debt depresses growth once a threshold of 90% debt/GDP ratio is exceeded is rejected
Imbs & Ranciere (2005:15-20)	An analysis of debt overhang	1970-2002	87 developing countries	OLS, fixed effects and system GMM	-37 cases of debt overhang confirmed -Negative effect of debt occurs once debt levels

Author(s)	Subject	Period	Countries	Methodology	Results
					reach 60% of GDP or 200% of exports
Kourtellos *et al.* (2013:35)	Analysis of nonlinear relationship between debt and growth	1980-2009	82 countries	Structural threshold regression	Little evidence is found for nonlinear relationship between debt and economic growth
Kumar and Woo (2010:16-18)	Investigation of the debt overhang hypothesis	1970-2007	38 advanced and emerging market economies	Endogenous growth models	-Negative relationship exists between initial debt and subsequent growth -Nonlinear relationship exists between debt and growth, with 90% debt/GDP ratio turning point
Nhu *et al.* (2016:100	Nonlinear effect of public debt on economic growth	1985-2013	15 developing countries	Threshold regression	Debt threshold in the relationship between public debt and economic growth falls between 13% and 39% of debt/GDP ratio
Pattillo *et al.* (2002:19)	Nonlinear effect of external debt on economic growth	1969-1998	93 developing countries	OLS, FE, system GMM and IV	Debt has a nonlinear impact on debt, with threshold of 35-40% debt/GDP ratio and 160-170% debt/export ratio
Pattillo *et al.* (2011:15-18)	Impact of public and private external debt on economic growth	1969-1998	93 developing countries	GMM	Inverted U-shaped relationship exists between external debt and economic growth
Presbitero (2010:9-10)	Relationship between debt and growth	1970-2007	92 low- and middle-income economies	GMM	Debt affects economic growth negatively up to a turning point of 90% of GDP beyond which it becomes ineffectual
Reinhart and Rogoff (2010:575-577)	Nonlinear effect of debt on growth	1800-2005	44 advanced and emerging economies	Comparative analysis	Impact of debt on growth is lower for debt/GDP ratio below 90%, but above this point, average growth rates fall by 1%
Reinhart and Rogoff (2010:573)	Analysis of the major debt overhang sequences	1800-2010	44 advanced and emerging economies	Comparative analysis	Developed countries suffer from both public and private debt overhangs and have already exceeded the critical 90% debt/GDP threshold
Schclarek (2004:8-14)	Relationship between debt and growth	1970-2002	59 developing and 24 industrial economies	System GMM	-The claim of an inverted U-shape relationship between debt and growth is rejected -Relationship between debt and growth is insignificant for industrial countries
Smyth & Hsing (1995:54-57)	Does optimal debt ratio exist in debt-growth nexus?	1960-1991	US	OLS	Debt/GDP ratio of 38.4% corresponds to the maximum growth of the economy

Table 3.3: Summary of studies on transmission channels between external debt and economic growth

Author(s)	Subject	Period	Countries	Methodology	Results
Ajisafe *et al*. (2006:56-60)	Causality between external debt and foreign private investment	1970-2003	Nigeria	VAR	A bi-directional causality exists between external debt and foreign private investment
Checherita-Westphal & Rother (2012:1395)	Impact of debt on per capita GDP growth	1970-2008	12 euro area countries	Dynamic panel models	Private saving, total factor productivity, public investment and long-term nominal and real interest rates are affirmed as channels of transmission
Clements *et al*. (2003:15-18)	Channels of transmission between debt and growth	1970-1999	55 low-income countries	FE and system GMM	Public investment is identified as the channel through which debt affects growth negatively
Desphande (1997:183-185)	Investment experience of indebted countries	1971-1991	13 heavily indebted countries	Fixed effects	Relationship between external debt and investment is consistently negative
Ezirim *et al.* (2006:37-42)	Link between external debt, foreign direct investment and economic growth	1970-2001	Nigeria	Fully modified Philips-Hansen regression	Neither external debt burden nor foreign direct investment has impact on growth output levels
Kumar & Woo (2010:16-18)	Channels between debt and growth	1970-2007	38 advanced and emerging economies	OLS, Between Estimator, FE and system GMM	Investment and capital stock are affirmed as channels of transmission
Lau & Kon (2014:2172-2173)	Relationship between debt and growth	1988-2006	17 Asian countries	Cointegration and Granger causality	External debt affect growth indirectly by affecting exports positively through the GDP
Majumder (2007)	Crowding-out effect of debt on investment	1976-2006	Bangladesh	ECM	Public debt has a crowding-in, rather than crowding-out effect on investment.
Pattillo *et al.* (2004:15-17)	Channels between debt and growth	1969-1998	61 developing countries	OLS, IV, FE and GMM	Identified channels are physical capital accumulation and total factor productivity
Riffat & Munir (2015:21-28)	Channels between debt and growth	1991-2013	4 Asian countries	FE	Identified channels are private investment, public investment and total factor productivity

Table 3.4: Summary of studies on relationship between institutional quality and economic growth

Author(s)	Subject	Period	Countries	Methodology	Results
Alexiou *et al.* (2014:1)	Link between institutions and growth	1970-2012	Sudan	ARDL	Institutional environment is one of the most crucial factors affecting economic performance
Bormann *et al.* (2006:360-363)	Institutions and gains from trade	1985-2002	155 countries	OLS and IV	Institutions, especially regulatory quality plays crucial role in engendering positive relation between trade and growth
Calderon *et al.* (2012:1)	Role of institutions in the adoption of counter-cyclical macroeconomic policies	1980-2010	115 industrial and developing countries	GMM	Institutional quality plays an important role in a country's ability to implement counter-cyclical macroeconomic policies
Chong & Zanforlin (2000:22-23)	Relationship between institutional quality and economic growth	1970-1990	Latin American countries	OLS	Good institutions, good policies and good governance are linked with higher rates of growth
Dawson (1998)	Channels through which institutions affect the economy	1975-1990	Large sample of countries	OLS and 3SLS	Economic freedom affects growth through its effect on total factor productivity and investment
Decker & Lim (2008:708-720)	Link between democracy and growth	1970-2006	91 countries	OLS, 2 SLS and system GMM	Democracy has no effect on growth. Meanwhile, political-economic institutions affects economic growth positively
Dollar and Kraay (2002:25)	Impact of institutions and trade on growth	1970-2000	Several countries	OLS and IV	In the long run, both trade and institutions affect growth, while in the short run, trade is relatively more important in explaining differences in growth rates among countries
Hasan *et al.* (2009:167-168)	Effect of legal institutions, financial deepening and political pluralism on growth	1986-2002	China	GMM	The development of financial markets, legal environment, property rights and political pluralism affects growth positively
Iyoboyi & Pedro (2014:1)	Relevance of institutions to economic performance	1980-2012	Nigeria	VECM	one standard deviation innovation on institutional capacity depresses macroeconomic performance
Iyoboyi *et al.* (2016:21-24)	Effect of institutional and policy environments on industrialization	1980-2014	Nigeria	Cointegration regression	There is a long-run association between institutional environment and industrialization

Author(s)	Subject	Period	Countries	Methodology	Results
Kormendi & Meguire (1985:1)	Effect of civil liberties on economic performance and investment	1950-1977	47 economies	Comparative analysis	Civil liberties have marginal and dramatic effects on growth and investment respectively
Marakbi & Turcu (2016:1)	Link between institutional quality and economic growth	1975-2012	128 developed and developing countries	Panel smooth transition regression	Relationship between corruption and economic growth is nonlinear
Rodrik *et al.* (2004:131-165)	Contributions of institutions, trade and geography to growth	1970-2000	137 countries	OLS and IV	Institutions are the main determinants of income levels, relative to the other two variables
Scully (1988:658-661)	Role of institutions in economic development	1960-1980	115 countries	OLS	There is a positive relationship between level of freedom and economic growth
Udah and Ayara (2014:16)	Link between institutions, governance structure and economic performance	1970-2011	Nigeria	OLS and factor analysis	Governance structure and institutional quality are very crucial for improved economic performance
Vitola and Senfelde (2015:277)	Development of a model that exemplifies the institutions-economic development nexus	NA	NA	Synthesis, deduction, and logical and comparative analyses	Institutions aid technological progress and also affect socio-economic development around the world

Table 3.5: Summary of studies on the role of institutions in external debt-economic growth nexus

Author(s)	Subject	Period	Countries	Methodology	Results
Cordella *et al.* (2005:17-19)	Debt-growth nexus vis-à-vis other country characteristics	1970-2002	79 developing countries	OLS and system GMM	Effect of debt overhang and irrelevance thresholds is found to be lower in countries with poor policies and institutions
Daud & Podivinsky (2014:1182)	Role of institutional quality in government debt-economic growth nexus	1970-2011	Malaysia	Hansen (2000) threshold regression	A minimum threshold of institutional quality needs to be attained for government debt to benefit the economy
Edet-Nkpubre (2013:61)	Relationship between external debt management, institutions and economic growth	Not Applicable	Not Applicable	Qualitative analysis	Institutional quality plays a very crucial role in determining how external debt affects economic growth in a country
Freytag & Pehnelt (2008:77)	Determinants of debt relief	1990-2004	123 countries	Comparative analysis	-Actual debt burden not a factor before the 21st century

Author(s)	Subject	Period	Countries	Methodology	Results
					-Governance factors becomes a factor at the beginning of the 21st century
Imbs and Ranciere (2005:20)	Analysis of debt overhang hypothesis	1969-2002	87 developing countries	OLS, FE and system GMM	Institutional quality indicators control debt accumulation and also enhance economic growth
Kaminsky and Pereira (1996:1)	Debt overhang hypothesis vis-à-vis breakdown of growth	1980-1989	Latin American countries	Endogenous growth model	Effect of social inequality on government policy and consumption crucial in debt servicing-output nexus
Kourtellos *et al.* (2013:35)	Impact of public debt on growth	1980-2009	82 countries	Structural threshold regression	Relationship between debt and growth is moderated by the quality of institutions in a country
Melecky (2012:232)	Link between debt management, institutions and past debt	1970-2010	107 countries	Logit regression	Institutional quality and democratic accountability determine a country's debt management strategy
Muhanji and Ojah (2011:199)	Management and sustainability of external debt	1970-2008	African, East Asian and Latin American countries	FE	Stable political environment and effective legal institutions are very critical to attaining the objective of external debt reduction
Ouedraogo (2015:139)	Effect of external debt and institutional quality on growth	1970-2010	6 WAEMU countries	Error correction model	-Institutional factors affect growth positively -External debt-growth nexus is nonlinear
Qayyum *et al.* (2014:47-48)	Impact of foreign aid, debt and governance on growth in an open economy	Not Applicable	Not Applicable	Ramsey-Cass-Koopmans growth model	To attain high growth rates, developing countries must have high governance quality and attract foreign aids, rather than external debt

3.4 CONCLUSION

This review of literature conclusively shows that results are mixed as regards the effect of debt on economic growth. The various patterns of impact found are monotonically increasing, monotonically decreasing and, inverted U-shaped and indifferent impacts. In the case of studies that affirm inverted U-shaped relationship between the two variables, findings in the reviewed literature clarified that the threshold value of debt beyond which it begins to have pernicious effect on growth varies across countries, regions and studies. Furthermore, the review suggests that sub-

Saharan African countries have not received adequate attention concerning the presence or otherwise of nonlinearity in the relationship between debt and growth, as most studies regarding this topic have been conducted for developed countries as well as developing countries pooled together. In other words, the majority of the limited number of studies that consider the sub-Saharan African countries pool just a few of them with several other developing countries from different regions of the world to make inferences about the former, despite there being no consistent uniformity in economic structures across regions. Hence, it is important to ascertain the precise behaviour of these variables and the debt threshold values for sub-Saharan African countries within the context of nonlinear analysis.

When it comes to the identification of the channels of transmission from debt to economic growth, most studies recognise investment as the main channel of transmission. However, findings from the literature are mixed as regards the other identified channels, such as interest rates, savings, physical capital accumulation and total factor productivity. Furthermore, no previous study has identified the channels of transmission in the debt-growth nexus for sub-Saharan African countries. This therefore created a gap in the literature, which this study intended to fill with the application of appropriate econometric processes.

Furthermore, most of the previous studies reviewed suggest that institutional quality makes a vital contribution to economic growth. In addition, most of them are in agreement that proper institutional quality in a country could lead to a positive relationship between debt and economic growth. However, none of them suggests the minimum level of institutional quality required for this to be achieved. Achieving the intention to fill this gap in the body of knowledge was accomplished by estimating the threshold of institutional quality in the relationship between external debt and economic growth for sub-Saharan African countries.

The research methodology for this study is presented in the next chapter: it addresses important aspects of the study such as research design, theoretical framework, model specification, description of variables and estimation technique.

CHAPTER 4

RESEARCH METHODOLOGY

4.1 INTRODUCTION

This chapter is geared towards a description of the methodology employed by the researcher in achieving the research objectives set out in chapter one. The Chapter begins with a description of the research design and methodology which contains the nature of data and sample selection, theoretical framework and model specification. It also captures a description of variables used in the study, as well as providing an elucidation of the estimation technique.

4.2 RESEARCH DESIGN AND TECHNIQUE

Research design and technique remains central to a research work as it helps the researcher to achieve the stated objectives by outlining the methods for addressing the problem statement as well as the process of generating results and conclusions (Leedy, 1997:195). Hence, it needs to be clearly adumbrated in a research study. This section, therefore, outlines the research design, sample selection and period, nature of data, the theoretical framework, as well as model specification.

4.2.1 Research design

The research design refers to the overall blueprint that outlines the methods of data collection and analysis for the purpose of addressing the research questions, and as such, helps the researcher towards obtaining quality and credible results (Macmillan & Schumacher, 2001:166). It therefore contains the population target, sample size, nature of data, theoretical framework, model specification and method of data analysis. The nature of data, method and analysis usually takes either a qualitative or a quantitative form (Johnson & Christensen, 2008:34). Qualitative research, which is exploratory in nature, refers to a scientific method for understanding and interpreting issues by employing images, observations, films and other non-numerical data. On the other hand, quantitative research involves a process of collecting numerical data to analyse the relationship between variables, as well as the use of mathematical, statistical and econometric models to test, measure and analyse variables (Burns & Grove, 1993:777; Creswell, 2003:153; Merriam, 2009:13). In light of this, the study employed a quantitative research design in exploring the

relationship between external debt, institutional quality and economic growth in SSA because it is more scientific, objective, time-saving and focussed, especially in comparison to the qualitative research design (Cresswell, 2003:154).

4.2.2 Study period and sample selection

This section discusses the scope of the study as it concerns the study period and the area or sample of research. The study covered a 33-year period between 1985 and 2017. The choice of 1985 as the starting period was informed by the fact that SSA experienced the beginning of an upsurge in external debt accumulation, as well as a massive slowdown in economic growth during the 1980s. In addition, availability of data for the sample countries played a role in the choice of the study period. Data sets for 30 SSA countries were analysed in the study. The study area or sample was limited to the 30 countries because of the paucity of important data sets for the remaining SSA countries. The 30 countries, however, cut across all the geographical areas that constitute the region, thereby comprising a good and representative sample of SSA. The list of the countries is contained in Appendix 2.

4.2.3 Nature of data

The study employed annual secondary data to explore the relationship between external debt, institutional quality and economic growth in SSA. The key data sets used in the study included those of external debts (represented by external debt/GNI ratio; external debt/export ratio; total external debt stocks; and external debt interest payment/export ratio), economic growth (represented by GDP per capita), institutional quality composite indexes (obtained by adding and averaging institutional quality variables) of the International Country Risk Guide (ICRG) data provided by the Political Risk Services (PRS) group, and the World Governance Indicators (WGI) furnished by the World Bank, trade openness (obtained by the addition of exports and imports as a ratio of GDP) and investment (represented by gross fixed capital formation). These data sets were employed within a panel framework which stems from a combination of both time series and cross-sectional observations (Hsiao, 2007:1). Hence, the data sets employed in this study consisted of 30 cross-sectional units, that is, 30 countries and 33 time-series observations for each cross section. The choice of panel data for the study was informed by its various advantages over the time-series or cross-sectional data. First, not only does it increase the total number of observations

and their variability, it also reduces the noise coming from the individual time series, hence, heteroscedasticity is not an issue in panel data. Moreover, it provides more degrees of freedom and reduces collinearity among the regressors, thereby improving the efficiency of econometric estimates. Lastly, it is highly suitable for studying dynamic changes because of the repeated cross-sectional observations it entails (Greene, 2011:314; Hsiao, 2003:152).

4.2.4 Theoretical framework

This study is premised on the neoclassical growth theory which analyses the attainment of economic growth through the right combination of three main driving forces of growth: capital, labour and technology or total factor productivity. The theory disagrees with the positions of the earlier growth theories that underdevelopment results from heavy reliance on external forces and that growth could only be attained through high capital accumulation. Rather, it argues that underdevelopment only stems from resource misallocation occasioned mostly by inefficient pricing and large government interference in the economy (Todaro & Smith, 2006:243).

Notable among the first set of models that attempted to explain growth within the neoclassical framework were the Solow (1956) and Swan (1956) models. Their models, which signalled the starting point for most studies on growth up to the present day portrayed labour, capital and technological change as the main determinants of long-run growth, where the level of technological change is exogenously determined and independent of the other factors. The critical assumption of the model is that it is characterised by constant returns to scale. Other assumptions include availability of complete information and perfect competition, as well as absence of externalities. A model based on a Cobb-Douglas production function was presented by them. In line with their proposition and following inspiration from relevant literature (Demetriades & Law, 2006:24; Lau, 2015:98; Qayyum & Haider, 2012:104), we assume for this study that the output in each country in our sample is determined by the following Cobb-Douglas production function:

$$Y_{it} = K_{it}^{\theta}(A_{it}L_{it})^{1-\theta} \tag{4.1}$$

where Y_{it} is real income in country i at time t, K_{it} is the capital stock in country i at time t, L_{it}= is the stock of labour in country i at time t, while A_{it} is the level of technology or total factor

productivity in country i at time t. Moreover, θ, which denotes the elasticity of output is the share of capital, while $1-\theta$ is the share of labour, where $0<\theta<1$.

The multiplicative nature of A and L in the model implies that AL is known as effective labour; when technological progress enters the model in this manner, the model is regarded as a labour-augmenting or Harrod-neutral model. Since the production function $Y(K, AL)$ is characterised by constant returns to scale, equation (4.1) can be expressed as output per unit of effective labour if we divide through by AL.

$$\frac{Y_{it}}{A_{it}L_{it}} = \frac{K_{it}^{\theta}(A_{it}L_{it})^{1-\theta}}{A_{it}L_{it}} = \frac{K_{it}^{\theta}}{(A_{it}L_{it})^{\theta}} \tag{4.2}$$

Therefore,

$$y_{it} = k_{it}^{\theta} \tag{4.3}$$

Equation (4.3) represents the intensive form of the Solow-Swan production function. It is assumed that the intensive-form production function $f(k)$ satisfies $f(0)=0, f'(k)>0$ and $f''(k)<0$. Furthermore, the first and second derivatives of $f(k)$ are assumed to satisfy the Inada conditions (Inada, 1964:49) which are as follows:

$lim_{k\to\infty} f'(k) = 0;\ lim_{k\to 0} f'(k) = \infty.$

These two assumptions which serve to ensure that the economy's path does not deviate and that the Cobb-Douglas production function satisfies the features of neoclassical production function indicate that the marginal product of capital is large when the stock of capital in the economy is very small, but it becomes very small as soon as the stock of capital becomes large. In other words, these assumptions suggest decreasing returns to capital.

Another critical assumption of the model is concerned with how the stocks of capital, labour and total factor productivity change over time. Given the fact that the model is defined in terms of a continuous time dimension, the initial levels of capital, labour and technology are taken as given and strictly positive. Moreover, the growth rates of labour and technology are constant as follows:

$$\frac{dL_{it}}{dt} = nL_{it} \tag{4.4}$$

$$\frac{dA_{it}}{dt} = gA_{it} \tag{4.5}$$

where n and g denote exogenous rates of growth of labour and technology respectively.

Given the fact that the growth rate of a variable is analogous to the rate of change of its natural log, equations (4.4) and (4.5) at time 0 can be transformed into the following:

$$lnL_{it} = lnL_{i0} + nt \tag{4.6}$$

$$lnA_{it} = lnA_{i0} + gt \tag{4.7}$$

By expressing equations (4.6) and (4.7) exponentially, the following equations are derived:

$$L_{it} = L_{i0}e^{n_{it}} \tag{4.8}$$

$$A_{it} = A_{i0}e^{g_{it}} \tag{4.9}$$

Given other important factors that influence technology or total factor productivity in line with the literature, equation (4.9) can be expressed thus:

$$A_{it} = A_{i0}e^{g_i t + D_{it}\rho_i} \tag{4.10}$$

where g_i is the exogenous rate of technological progress in country i, D_{it} is a vector of external debt, institutions and other variables that affect total factor productivity and technological progress in country i and time t; while ρ_i is a vector of parameters for these variables. This framework suggests that total factor productivity or labour-augmenting technology (variable A) is influenced by exogenous technological progress (g), as well as other variables such as the level of external debt and institutional quality. According to Riffat and Munir (2015:25), governments are usually not eager to execute costly reforms (without which productivity might not improve) when they realise that the main beneficiaries would be their foreign creditors. These researchers also argued that economic uncertainties arising from external debt accumulation and its repayment often constitute disincentives to improve technology. These positions were also corroborated by

Checherita-Westphal and Rother (2012:1395) and Pattillo *et al.* (2004:16). Also, Demetriades and Law (2006:257) considered the existence of sound institutions to be critical for improved labour productivity in an economy. They suggested that ineffective and inefficient institutions produce unproductive labour, enmeshed in rent-seeking activities. Similarly, weak institutions are considered to be negatively related to labour productivity (Nelson & Sampat, 2001:50; North, 1990:118).

From the foregoing, it can be deduced that output per effective labour is constant and evolves according to equation (4.3). However, output per labour ($^{Y}/_{L}$) grows at the exogenous rate g, and evolves as follows:

$$\frac{Y_{it}}{L_{it}} = \frac{A_{it}L_{it}^{1-\theta}K_{it}^{\theta}}{L_{it}} \tag{4.11}$$

$$y_{it} = A_{it}(k_{it})^{\theta} \tag{4.12}$$

Expressing equation (4.12) in log form, it is transformed into:

$$lny_{it} = lnA_{it} + \theta lnk_{it} \tag{4.13}$$

By expressing equation (4.10) in log form and substituting it in equation (4.13), the following equation is derived:

$$lny_{it} = lnA_{0i} + (1-\theta)g_i t + (1-\theta)\rho_i D_{it} + \theta lnk_{it} \tag{4.14}$$

Equation (4.14) demonstrates that output per labour is affected by a vector of external debt and institutions (which may vary over time) and the level of physical capital. This equation is logical for this study's estimations as its validity holds whether it is within or beyond the steady state. Furthermore, its validity does not depend on assumptions regarding behaviour of saving, which may lead to unrealistic results.

To enable estimations, equation (4.14) is expressed in functional form by adding an error term:

$$lny_{it} = lnA_0 + (1-\theta)g_i t + (1-\theta)\rho_{1i}D_{1it} + (1-\theta)\rho_{2i}D_{2it} + \theta lnk_{it} + \varepsilon_{it} \tag{4.15}$$

where D_1 is external debt, D_2 is institutional quality and ε_{it} is the error term.

Moreover, a quadratic functional form of equation (4.15) can be developed, with respect to D_1 so as to include a nonlinear term of external debt in the equation:

$$lny_{it} = lnA_0 + (1-\theta)g_i t + (1-\theta)\rho_{1i}D_{1it} + ((1-\theta)\rho_{2i}D_{1it})^2 + (1-\theta)\rho_{3i}D_{2it} + \theta lnk_{it} + \epsilon_{it} \quad (4.16)$$

where ϵ_{it} is a new error term.

Furthermore, an interactive term between external debt and institutional quality can be included in equation (4.15) as follows:

$$lny_{it} = lnA_0 + (1-\theta)g_i t + (1-\theta)\rho_{1i}D_{1it} + (1-\theta)\rho_{2i}D_{2it} + (1-\theta)\rho_{3i}(D_{1it}D_{2it}) + \theta lnk_{it} + \mu_{it} \quad (4.17)$$

where μ_{it} is a new error term.

The specification of the empirical models for this study is founded on equations (4.15), (4.16) and (4.17). These three equations can be respectively expressed in their reduced forms as follows:

$$lny_{it} = \beta_{0i} + \beta_{1i}g_i t + \beta_{2i}ED_{it} + \beta_{3i}IQ_{it} + \beta_{4i}X_{it} + \beta_{5i}lnk_{it} + \varepsilon_{it} \quad (4.18)$$

$$lny_{it} = \beta_{0i} + \beta_{1i}g_i t + \beta_{2i}ED_{it} + \beta_{3i}(ED_{it})^2 + \beta_{4i}IQ_{it} + \beta_{5i}X_{it} + \beta_{6i}lnk_{it} + \epsilon_{it} \quad (4.19)$$

$$lny_{it} = \beta_{0i} + \beta_{1i}g_i t + \beta_{2i}ED_{it} + \beta_{3i}IQ_{it} + \beta_{4i}(ED * IQ)_{it} + \beta_{5i}X_{it} + \beta_{6i}lnk_{it} + \mu_{it} \quad (4.20)$$

Where $\beta's$ denote parameters to be estimated, while ED, IQ and X represent external debt, institutional quality and a vector of control variables respectively.

4.2.5 Model specification

To analyse the relationship between external debt, institutional quality and economic growth, three empirical objectives were formulated for the study. In this sub-section, appropriate models would be specified to address these objectives. In each of these models, the natural logarithms of GDP

per capita and total external debt stocks were employed in order to reduce the possibility of heteroscedasticity in the model. The author did not transform the remaining variables logarithmically as they were already in ratios. As a way of extenuating variations in magnitudes of variables among cross-sections and consequently reducing the likelihood of heteroscedasticity, such logarithmic transformation has been suggested in the literature (Uusitalo, 2012:14; Guo *et al.,* 2012:1082).

The first empirical objective is to investigate the nonlinear effect of external debt on economic growth. Following extant empirical analyses on the subject such as those by Ouedraogo (2015:129) and Presbitero (2008:6), and in line with equation (4.19) from the theoretical framework, a dynamic panel model is specified for the objective as follows:

$$LGDP_{it} = \alpha_{0i} + \alpha_{1i}LGDP_{i,t-1} + \alpha_{2i}ED_{it} + \alpha_{3i}ED_{it}^2 + \alpha_{4i}X_{it} + \mu_i + \varepsilon_{it} \quad (4.21)$$

Where i and t are cross-sectional units and the time period, respectively, $LGDP$ is log of real GDP per capita, representing economic growth, $LGDP_{i,t-1}$ is the lagged dependent variable to measure the extent of persistence in economic growth variable, ED is the external debt variable, denoting the level of external debt (comprising external debt as a percentage of GNI, external debt as a percentage of export, external debt interest payment as a percentage of export and total external debt stocks), ED^2 is the squared term of the external debt variable, X is a vector of control variables, α_{1i}, α_{2i}, α_{3i} and α_{14i} are the parameters to be estimated, μ_i represents the individual country-specific effects to capture unobserved heterogeneities among countries, and ε_{it} is the error term.

The importance of including control variables in growth models was emphasized by two major proponents of the endogenous growth theory, Lucas (1988:6) and Romer (1986:1020). Following the emphasis of Acemoglu *et al.* (2002:1232), Jalilian *et al.* (2006:87) and Rodrik *et al.* (2004:132) on the role of institutions in understanding differences in income levels between developed and developing economies, as well as studies on growth such as those by Mankiw *et al.* (1992:421) and Yao and Wei (2007:221), key variables such as institutional factors, total investment, human capital and trade openness have been included in equation (4.21).

This model was based on the hypothesis that the impact of external debt on growth is not always negative or positive, so that external debt at lower levels could enhance growth before reaching a certain threshold beyond which it begins to exert negative impact on growth. Hence, in this model, the focal point would be the significance (or otherwise) and the magnitude of α_{2i} and α_{3i}. To establish nonlinearity in the relationship between external debt and growth, the two parameters must be significant and bear opposite signs, otherwise the relationship would be adjudged linear. If α_{2i} and α_{3i} were both significant with the former and the latter being negative and positive, respectively, then the relationship is U-shaped or convex. On the other hand, if α_{2i} and α_{3i} were both significant with the former and the latter being positive and negative, respectively, then the relationship is inverted U-shaped or concave. From the equation, the external debt threshold can be estimated (in the case of both coefficients being significant and bearing opposite signs) by finding the first partial derivative of real GDP per capita with respect to external debt and setting the same equal to zero to obtain equation (4.22) as the external debt threshold :

$$\frac{\partial LGDP_{it}}{\partial ED_{it}} = \frac{-\alpha_{2i}}{2\alpha_{3i}} \tag{4.22}$$

The second empirical objective centres upon investigating the channels that are capable of spreading the effect of external debt to economic growth. In line with extant literature (Checherita-Westphal & Rother, 2012:1395; Riffat & Munir, 2015:13; Schclarek, 2004:4), this study tests the channels of public investment, private investment, total factor productivity, savings and interest rate by way of investigating the impact of external debt on each of the variables. The significance or otherwise of each variable's coefficients would serve to confirm whether or not the variable indeed serves as a channel in the external debt-growth nexus in the sample countries.

For a private investment channel, the following dynamic model was employed:

$$PRINV_{it} = \vartheta_{0i} + \vartheta_{1i}PRINV_{i,t-1} + \vartheta_{2i}ED_{it} + \vartheta_{3i}ED_{it}^2 + \vartheta_{4i}X_{it} + \mu_i + \varepsilon_{it} \tag{4.23}$$

where i and t are cross-sectional units and the time period, respectively, $PRINV$ is gross fixed capital formation by the private sector as a percentage of GDP, denoting private investment, ED and ED^2 are the external debt variable and its squared term respectively, X is a vector of control variables which include economic growth, public investment, interest rate and trade openness,

$PRINV_{i,t-1}$ is the lagged dependent variable, μ_i is the country-specific effect, and ε is the is error term.

For the other type of investment, public investment, the following dynamic model was estimated:

$$PUINV_{it} = \sigma_{0i} + \sigma_{1i}PUINV_{i,t-1} + \sigma_{2i}ED_{it} + \sigma_{3i}ED_{it}^2 + \sigma_{4i}X_{it} + \mu_i + \varepsilon_{it} \quad (4.24)$$

where i and t are cross-sectional units and the time period, respectively, $PUINV$ is gross fixed capital formation as a percentage of GDP generated by the public sector, representing public investment, ED and ED^2 are the external debt variable and its squared term respectively, X is a vector of control variables which include population growth rate, private investment, and interest rate, $PUINV_{i,t-1}$ is the lagged dependent variable, μ_i is the country-specific effect and ε is the error term.

The estimated model for the channel of total factor productivity was as follows:

$$TFP_{it} = \varphi_{0i} + \varphi_{1i}TFP_{i,t-1} + \varphi_{2i}ED_{it} + \varphi_{3i}ED_{it}^2 + \varphi_{4i}X_{it} + \mu_i + \varepsilon_{it} \quad (4.25)$$

where i and t are cross-sectional units and the time period, respectively, TFP is total factor productivity, ED and ED^2 are the external debt variable and its squared term respectively, X is a vector of control variables which include institutional quality, population growth rate, investment, human capital, economic growth and trade openness, $TFP_{i,t-1}$ is the lagged dependent variable, μ_i is the country-specific effect and ε is the error term.

For the channel of savings, the following dynamic model was estimated:

$$SAV_{it} = \omega_{0i} + \omega_{1i}SAV_{i,t-1} + \omega_{2i}ED_{it} + \omega_{3i}ED_{it}^2 + \omega_{4i}X_{it} + \mu_i + \varepsilon_{it} \quad (4.26)$$

where i and t are cross-sectional units and the time period, respectively, SAV is gross national savings as a percentage of GDP, ED and ED^2 are the external debt variable and its squared term respectively, X is a vector of control variables which include human capital, population growth rate and economic growth, $SAV_{i,t-1}$ is the lagged dependent variable, μ_i is the country-specific effect, and ε is the error term.

Lastly, the estimated model for the channel of interest rate was as follows:

$$INT_{it} = \gamma_{0i} + \gamma_{1i} INT_{i,t-1} + \gamma_{2i} ED_{it} + \gamma_{3i} ED_{it}^2 + \gamma_{4i} X_{it} + \mu_i + \varepsilon_{it} \quad (4.27)$$

where i and t are cross-sectional units and the time period, respectively, INT is the real interest rate, ED and ED^2 are the external debt variable and its squared term respectively, X is a vector of control variables which include the inflation rate, economic growth and trade openness, $INT_{i,t-1}$ is the lagged dependent variable, μ_i is the country-specific effect, and ε is the error term.

The third empirical objective seeks to examine the role of institutional quality in the external debt-economic growth nexus. With inspiration from relevant literature (Gazdar & Cherif, 2015:141; Law *et al.*, 2018:5), and in line with equation (4.20) in the theoretical framework, an empirical model with linear interaction between external debt and institutional quality was specified as follows:

$$LGDP_{it} = \theta_{0i} + \theta_{1i} LGDP_{i,t-1} + \theta_{2i} ED_{it} + \theta_{3i} (ED * IQ)_{it} + \theta_{4i} IQ_{it} + \theta_{5i} X_{it} + \mu_i + \varepsilon_{it} \quad (4.28)$$

where i and t are cross-sectional units and time period, respectively, $LGDP$ is log of real GDP per capita, ED is external debt as a percentage of GNI, IQ is an index of institutional quality, $(ED * IQ)$ is the term of interaction of external debt and institutional quality, X is a vector of control variables which include investment, human capital and trade openness, $LGDP_{i,t-1}$ is the lagged dependent variable, μ_i is the country-specific effect, and ε is the error term.

Equation (4.28) indicates that the responsiveness of economic growth to external debt is contingent upon an index of institutional quality. It therefore allows us to evaluate whether the effect of external debt on economic growth differs between countries with different levels of institutional quality, by deriving the partial derivative of log of real GDP per capita with respect to external debt as follows:

$$\rho = \frac{\partial LGDP_{it}}{\partial ED_{it}} = \theta_{2i} + \theta_{3i} IQ_{it} \quad (4.29)$$

Within this framework, ρ in equation (4.29) indicates the marginal effect of external debt on economic growth. In other words, it measures the responsiveness of the steady state level of economic growth to external debt. The contingency hypotheses in this specification revolve around parameters θ_{2i} and θ_{3i}, with the following four possibilities emerging:

(1) If $\theta_{2i} > 0$ and $\theta_{3i} > 0$, external debt affects economic growth positively and institutional factors enhance that positive effect.
(2) If $\theta_{2i} > 0$ and $\theta_{3i} < 0$, external debt affects economic growth positively and institutional factors depress that positive effect.
(3) If $\theta_{2i} < 0$ and $\theta_{3i} > 0$, external debt affects economic growth negatively and institutional factors mitigate that negative effect.
(4) If $\theta_{2i} < 0$ and $\theta_{3i} < 0$, external debt affects economic growth negatively and institutional factors exacerbate that negative effect.

The threshold of institutional quality beyond which external debt could enhance economic growth can be determined from equation (4.29) by deriving the positive impact of external debt on economic growth as follows:

$$\rho > 0 \quad \leftrightarrow \quad \theta_{2i} + \theta_{3i} > 0$$

Hence, the threshold level of institutional quality beyond which external debt would be beneficial to economic growth is attained when $IQ_{it} > \frac{-\theta_{2i}}{\theta_{3i}}$.

4.3 DESCRIPTION OF VARIABLES

This section defines each of the variables employed in the study and explains its measurement. Moreover, the rationale behind using them either as dependent or explanatory variables is also elucidated. This section is further divided into two, firstly description and measurement of dependent variables, and secondly, description and measurement of explanatory variables.

4.3.1 Description and measurement of dependent variables

There are six dependent variables in this study: economic growth, private investment, public investment, total factor productivity, savings and interest rate. These variables are subsequently discussed in detail.

4.3.1.1 Economic growth

Economic growth, which was measured by real gross domestic product (GDP) per capita and growth rate of GDP, was treated as the dependent variable in the growth models (for example, Ouedraogo, 2015:135; Riffat & Munir, 2015:13). GDP is the sum of gross value added by all residents in the economy plus any product taxes, but minus any subsidies not included in the products' values. It is computed without any deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Values are based on market prices (constant 2010 US$) for real GDP per capita, and annual percentage for GDP growth rate. The datasets were sourced from the World Development Indicators or WDI (World Bank, 2018). In the growth models, economic growth was the dependent variable which may be affected by various explanatory variables such as external debt, institutional factors, investment, human capital, population growth rate and trade openness.

4.3.1.2 Investment

To investigate whether or not investment constitutes a channel of transmission between external debt and economic growth, it was disaggregated into private investment and public investment, both of which were treated as dependent variables as part of the models testing the channels. The literature is replete with studies that investigate investment as a channel of transmission in the debt-economic growth nexus (Checherita-Westphal & Rother, 2012; Clements *et al.*, 2003; Pattillo *et al.*, 2004; Riffat & Munir, 2015; Schclarek, 2004). The rationale behind investment channel stems from the debt overhang hypothesis which postulates that an increase in a country's level of debt accumulation breeds expectations of impositions of higher taxes, which in turn lead to investors and potential investors lowering their expectations of potential future returns. The consequence of this is a reduction in formation of the much needed capital stock for growth stimulation. Private investment was represented in the model by gross fixed capital formation (GFCF) generated by the private sector as a percentage of GDP and is sourced from the World Bank's WDI (2018). Public investment was represented by GFCF generated by the public sector as a percentage of GDP, and was sourced from WDI by subtracting the GFCF by the private sector from the total GFCF. GFCF is defined to include land improvements; plants, machinery and

equipment purchases; and the construction of roads, railways and the like, including schools, offices, hospitals, private residences and industrial buildings (WDI, 2018).

Furthermore, investment was treated as a control variable in the growth models and was measured by GFCF as a percentage of GDP; it was sourced from WDI. For this study, investment was expected to have a positive sign in line with extant literature (Ouedraogo, 2015:137; Presbitero, 2008:28; Riffat & Munir, 2015:19; Schclarek, 2004:29).

4.3.1.3 Total factor productivity

Total factor productivity (TFP) is another variable that has been tested in existing studies as a channel through which the effects of debt are transmitted to economic growth (Checherita-Westphal & Rother, 2012; Kumar & Woo, 2010; Pattillo *et al.*, 2004; Riffat & Munir, 2015; Schclarek, 2004). The rationale behind testing TFP as a channel of transmission relates to the effect of debt overhang which culminates in growing uncertainties; these, according to Pattillo *et al.* (2004:3) could act as disincentive to improving technology. Furthermore, in the face of huge debt accumulation, if the government fears that the foreign creditors would be the ones to reap most of the gains accruing from undertaking better policies and reforms, it might be less inspired to undertake such reforms (Pattillo *et al*., 2004:19); when the environment is not conducive enough for investment to thrive in a country, economic growth suffers a decline. External debt is thus expected to negatively affect economic growth through this channel. The data set for TFP was sourced from the Penn World Table (Version 9.1.).

4.3.1.4 Savings

Savings was treated as a dependent variable in one of the models testing the channels of transmission in the external debt-economic growth nexus. Some of the existing studies that investigated this channel include Checheriter and Rother (2010:20) and Riffat and Munir (2015:16). The hypothesis is that huge accumulation of external debt discourages savings owing to growing uncertainties about the future. This in turn exerts negative impacts on investment, and subsequently on economic growth. It is measured by gross national savings as a percentage of GDP, and defined as gross disposable income minus final consumption expenditure, after

accounting for pension funds. Data for savings was sourced from the IMF's World Economic Outlook (2018).

4.3.1.5 Interest rate

The last channel of transmission in the external debt-economic growth nexus that was tested in the study is the interest rate. It has also been investigated as a channel of transmission by a few recent studies (Baldacci & Kumar, 2010; Checheriter & Rother, 2010:19; Gale & Orsgaz, 2003; Riffat & Munir, 2015:16). The variable was measured by the real interest rate and sourced from the World Bank's WDI.

4.3.2 Description and measurement of explanatory variables

The explanatory variables in this study consist of variables that affect economic growth as articulated in the theoretical framework: they include external debt, institutional quality, investment, population growth rate, human capital and trade openness. Others consist of control variables that affect the various variables which were tested as channels of transmission in the external debt-economic growth nexus: these include savings, interest rate, inflation rate and population growth rate. These variables are subsequently discussed in detail.

4.3.2.1 External debt

External debt, which is the main variable of interest, is the total debt owed to non-resident creditors and is the sum of public and publicly guaranteed debt, private nonguaranteed debt, use of the IMF credit and other short-term debts (World Bank, 2017:164). It was measured in this study by four different variables: external debt as a percentage of GNI, external debt as a percentage of export, interest payment on external debt as a percentage of export as well as total external debt stock, all of which were sourced from the WDI (2018) of the World Bank. These variables have been used to measure external debt in several extant studies such as Clements *et al.* (2003:8), Fosu (1996:101), Lau and Kon (2014:2171), Pattillo *et al.* (2011:8) and Schclarek (2004:16). In the model, the relationship between external debt and economic growth was expected to follow either a non-linear pattern (specifically, a concave or hump-shaped pattern) or a linear one. If the relationship is inverted U-shaped, it implies that external debt at moderate levels is expected to enhance growth until it reaches a threshold beyond which its impact on economic growth turns

negative (for example, Cordella *et al.*, 2005:19; Deshpande, 1997:169; Pattillo *et al.*, 2002:19). On the other hand, if the relationship turns out to be linear, then it indicates that external debt is expected to have a negative or positive impact on economic growth, regardless of its level (for example, Blavy, 2006:21; Schclarek, 2004:9; Schclarek & Ramon-Ballester, 2005:11).

4.3.2.2 Institutional quality

Institutional quality is one of the explanatory variables in the growth model; to measure it, a composite index of relevant ICRG institutional quality variables, sourced from the Political Risk Services (PRS) Group, was constructed. In order to capture the quality of institutions in the growth literature, the ICRG institutional quality data set has been widely employed in recent time (Bhattacharyya, 2009; Chong & Calderon, 2000; Knack & Keefer, 1995; Lau *et al.*, 2014). This is further confirmed by Williams and Siddique (2008:43) who described the ICRG institutional data as the most adopted data set for institutions. The composite institutional quality index was obtained by averaging the following six institutional quality elements: bureaucratic quality (range: 0-4); corruption (range: 0-6); investment profile (range: 0-12); law and order (range: 0-6); democratic accountability (range: 0-6); and government stability (range: 0-12).

The main reason for the choice of these six variables lies in the fact that in comparison to others, they are more relevant and more commonly used in explaining economic performance. The definition of all the six institutional quality variables are contained in Appendix 3. In order to enhance comparability, all the elements of the index are standardised to range between zero and ten, with higher scores indicating better institutional quality and vice-versa. For this study, the sign of the institutional quality variable is expected to be positive for the growth models in line with extant literature (Chong & Zanforlin, 2001:22; Hasan *et al.*, 2009:167; Iyoboyi *et al.*, 2016:21).

Furthermore, an alternative measure of institutional quality was employed to verify the robustness of the estimates for equation (4.28). This alternative proxy comprises the World Governance Indicators, published by the World Bank (2018). To measure institutional quality from this data, a composite index of institutional quality was formed by averaging the six governance indicators provided by the World Bank (2018), namely voice and accountability, corruption control, regulatory quality, political stability, government effectiveness and rule of law. Each of these

indicators ranges from -2.5 (weak governance performance) to 2.5 (strong governance performance).

4.3.2.3 Trade openness

Trade openness was treated as a control variable in the growth models; it is measured by total trade as a percentage of GDP, that is, the ratio of import plus export to the GDP ((Import+Export)/GDP). For this study, the sign of trade openness in the growth models is expected to be positive in accordance with the existing findings (Baum *et al.*, 2012:9; Cordella *et al.*, 2005:13; Ouedraogo, 2015:137; Presbitero, 2008:18). The data set for trade openness was sourced from WDI (2018).

4.3.2.4 Inflation rate

The inflation rate, which is the percentage rate of change in consumer prices, was treated as a control variable in some of the models testing the channels of transmission in the external debt-economic growth nexus. It was measured by the consumer price index (CPI) which indicates the annual percentage change in the cost of acquiring a basket of goods and services that may be fixed or changed on a regular basis. Generally, this is often computed by means of the Laspeyres formula. The data set was sourced from the WDI.

4.3.2.5 Population growth rate

The rate of population growth also served as a control variable in some of the models testing the channels of transmission in the external debt-economic growth nexus in line with extant literature (Checheriter & Rother, 2010:20; Riffat & Munir, 2015:15; Schclarek, 2004:39). It refers to the growth rate of all residents in a country, notwithstanding their citizenship or legal status. However, it excludes all refugees not permanently settled in the country, as they are considered part of their own country's population. Data on population growth rate for this study was sourced from WDI.

4.3.2.6 Human capital

Human capital has been included as one of the control variables in the growth models to test the hypothesis that countries with huge rich capital stock tend to attract investors, as well as ideas globally and are also able to innovate more productively (Grossman and Helpman, 1991:19). According to the endogenous growth theory, as put forward by Lucas (1988:19) and Romer

(1986:1006), human capital stock is pivotal in the developmental process of an economy. While some studies have suggested a positive effect of human capital on economic growth (for example, Radelet *et al.*, 2001:26), others have suggested it has a negative effect on growth (for instance, Barro, 2003:270). Hence, the coefficients of human capital in the models are expected to be either positive or negative. To capture human capital, data on life expectancy at birth, sourced from the WDI (2018) was employed. This was due to the incompleteness of other proxies such as years of secondary education and school enrolment. Also, this variable has been amply used to measure human capital by various studies (Gomez-Puig & Sosvilla-Rivero, 2017:474; Law *et al.*, 2018:17; Sachs & Warner, 1997). Furthermore, Jayachandran and Lleras-Muney (2009:14) assert that longer life expectation enhances human capital stock since a longer time horizon tends to enhance the value of profitable investment.

4.4 DESCRIPTIVE ANALYSIS AND STATISTICAL TESTS

Before proceeding to model estimation, there is need for a descriptive analysis of the key variables in the study by means of trend analysis of the variables. Trend analysis is important in this type of research because it identifies the behaviours of the variables in the study. It also enables the researcher to understand the possible reasons for the behaviours of the variables in certain ways, while also providing a synopsis on the relationship between the variables.

Similarly, it is important to conduct certain statistical tests on the variables under study before estimation. These tests include descriptive statistics, correlation analysis and panel unit root tests. Descriptive statistics refers to a quantitative summary of both dependent and independent variables. Put differently, descriptive statistics enables us to appreciate the features of the variables employed in the study such as the mean, median, maximum, minimum, standard deviation, kurtosis and normality of both the dependent and explanatory variables.

Correlation coefficients are also significant as they explain the nature of the association that exists between the variables of interest. Since interaction between variables could either be positive or negative, a positive and closer to one correlation indicates a strong positive correlation between the two variables, while a negative and closer to one correlation indicates a strong negative correlation. A correlation value of zero, meanwhile, indicates no relationship between the variables. The next sub-section discusses the panel unit root test.

4.4.1 Panel unit root test

In recent years, testing for unit root in panel data has become popular though it originates from time series (Baltagi, 2005:237; Pesaran, 2015:819). Consequently, different panel unit root tests have been developed especially in response to some likely issues such as homogeneity, cross-section dependence and small sample bias, the presence of which may derail the estimation process in dynamic panel analysis (Baltagi. 2005:237; Kauppi, 2000:242; Phillips & Moon, 2000:267). The assumption of homogeneity in most panel analyses in order to enable pooled regression could result in misleading inferences. The problem of cross-section dependence may also lead to inefficient estimators and nuisance parameters (Phillips & Sul, 2003:222). Furthermore, small sample bias in panel analysis is considered more detrimental in comparison to univariate autoregressions: it can sometimes be so serious that the parameter of the regression could fall outside its distribution (Nickell, 1981:1419). In order to overcome these problems, different panel unit root tests have been introduced. For this study, only three of these tests: Levin *et al.* (2002), Im *et al.* (2003) and Fisher-type tests using ADF and PP tests (Maddala & Wu, 1999) shall be discussed and applied.

4.4.1.1 Levin-Lin-Chu (LLC) unit root test

The LLC is one of the first generation unit root tests; it was introduced by Levin *et al.* (2002) under the assumption of a common unit root process across units in a panel data set. The test mechanism in LLC test requires a strongly balanced data set because the same value of error term is assumed for all the cross sections. The LLC specification requires the inclusion of the number of lags used in each cross-sectional unit, the kernel choices utilised in the computation and the exogenous variables employed. The LLC unit root test is hereby illustrated as follows:

$$\Delta y_{it} = \theta_i + \rho_i y_{i,t-1} + \sum_{j=1}^{p} \alpha_j \Delta y_{i,t-j} + \beta X_{it} + \epsilon_{it} \qquad (4.30)$$

where t and i denote the time period and the cross sections respectively. The LLC method tests the null hypothesis of $\rho_i = \rho = 0$, against the alternative hypothesis of $\rho_i = \rho < 0$. In other words, the LLC tests the null hypothesis that the series contain a unit root, against the null hypothesis that there is no unit root in the series. The test is based on the following statistics:

$$t_{\varphi} = \frac{\hat{\rho}}{se(\hat{\rho})} \tag{4.31}$$

H_0: series contains unit root ($\rho = 0$)

H_1: series does not contain unit root ($\rho \neq 0$)

The main disadvantage of the LLC unit root test lies in its assumption of cross-sectional independence as well as its restriction of ρ_i which is kept identical across the cross sections under the null and alternative hypotheses.

4.4.1.2 Im-Pesaran-Shin (IPS) unit root test

The IPS unit root test is also a first generation test developed by Im *et al.* (2003) and operates under the assumption of individual unit root processes. Put differently, it gives room for heterogeneity by allowing the coefficients of the various cross sections to differ, as this will adjust the power of the test in case a unit root is present. In developing this test, these authors suggest that individual unit root tests can be combined to generate a panel-specific result. Furthermore, the test employs regression that is lagged in order to address the issue of autocorrelation. The test with an individual cross-sectional ADF regression proceeds as follows:

$$\Delta y_{it} = \rho y_{i,t-1} + \sum_{p=1}^{j} \theta_i \Delta y_{i,t-1} + \beta X_{it} + \epsilon_{it} \tag{4.32}$$

The null hypothesis is as follows:

H_0: $\rho_i = 0, \forall\, i,$

The alternative hypothesis is given as:

H_1: $\rho_i = 0$, for $i = 1,2, \dots, N1$ or $\rho_i = 0$ for $i = N+1, N+2, \dots, N$ which indicates that a non-zero fraction of the individual process is stationary.

From the individual ADF regressions, the average of the t-statistics for ρ_i is adjusted to obtain the desired t-statistics

Hence, for the IPS unit root test,

H_0: series contains unit root ($\rho = 0$)

H_1: series does not contain unit root ($\rho \neq 0$)

4.4.1.3 Fisher-type (ADF and PP) unit root tests

The Fisher-type unit root tests were introduced by Maddala and Wu (1999) and Choi (2001) as tests that allowed for heterogeneity of cross-sectional coefficients. The Fisher-type tests which have stronger power and fewer restrictions in comparison to other panel unit root tests combine the p-values from individual stationarity tests. The Fisher Augmented Dickey-Fuller (ADF) panel unit root test relies on regression that is lagged on difference to address the issue of autocorrelation, while the Fisher Phillips-Perron (PP) panel unit root test is based on the Kernel weighting models in estimating long-run variances.

If we take σ_i as the p-value from any cross-sectional unit root test, then we can derive the following asymptotic result under the null hypothesis of unit root for all N cross sections:

$$-2\sum_{i=1}^{N}\log(\sigma_i) \rightarrow x^2 2N \tag{4.33}$$

In addition, Choi (2001) demonstrates that:

$$y = \frac{1}{\sqrt{N}}\sum_{i=1}^{N}\Phi^{-1}(\sigma_i) \rightarrow N(0,1) \tag{4.34}$$

where Φ^{-1} denotes the inverse of the standard normal cumulative distribution function.

Both the ADF and PP individual unit root test employ the asymptotic chi square and standard normal statistics and possess the same null hypothesis that the series contains a unit root.

H_0: series contain unit root ($\rho = 0$)

H_1: series does not contain unit root ($\rho \neq 0$)

4.5 ESTIMATION TECHNIQUE

This section is devoted to a discussion of the general framework employed for analysing the data. To achieve the empirical objectives of this study, equations (4.21) – (4.29) can be directly estimated by means of standard static panel data estimation techniques such as pooled OLS, fixed effects and random effects, which enable both time-series and cross-sectional variation in all variables. They offer advantages over pure time-series or cross-sectional estimation because they possess higher degrees of freedom, as well as greater sample variability, thereby generating more efficient estimates (Greene, 2011:154). However, these methods are plagued by a number of demerits which may impair the efficiency of their estimates.

The pooled OLS does not account for possible individual heterogeneity because it is an extremely restrictive model with an assumption of common intercept and slope coefficient for all cross-sections. While the fixed effects model operates under the assumption of a common slope, it nevertheless assumes individual-specific intercepts. Also, it enables the determination of both cross-sectional and time effects through the use of dummy variables. However, despite these qualities, the fixed effects model still suffers from potential loss of degrees of freedom (Baltagi, 2008:62). The random effects model attempts to avoid the loss of degrees of freedom by imposing a common intercept on all cross sections. Nevertheless, the model is limited by its assumption of time invariance, which is usually invalid in real life situations (Baltagi, 2005:15).

Furthermore, when some regressors in the model are endogenous, as is the case in the relationship between external debt and economic growth, where most of the explanatory variables employed in the growth model are endogenous to the dependent variable, the aforementioned static panel data estimation techniques usually generate biased parameter estimates (Campos & Kinoshita, 2008:12). In particular, evidence abounds in the literature that the debt and institutional variables often used in growth models have strong potential to be endogenous (Cecchetti *et al.,* 2011:11; Gomez-Puig & Sosvilla-Rivero, 2017:476; Kourtellos *et al.,* 2013:41; Kumar & Woo, 2010: 11; Panizza & Presbitero, 2014:4; Pattillo *et al.* 2011:3; Pescatori *et al.,* 2014:4). Moreover, it has been demonstrated in the literature that when a dynamic panel model with individual-specific effect, as in equations (4.21), and (4.23) - (4.28), is estimated by means of pooled OLS, fixed or random effect, or a standard least squares dummy variable estimator, estimates may be biased due to a

possibility that the lagged dependent variable and the country-specific effect may be correlated (Hsiao, 2003:207; Buck *et al.*, 2008:844). Also, in a pure cross-sectional regression, the individual-specific effect is part of the error term, which implies that biased parameter estimates may result from a potential linear correlation between the individual-specific effect and the regressors.

To address these problems, the Generalized Method of Moments (GMM) estimator was proposed, first by Holtz-Eakin *et al.* (1988), and further popularised by Arellano and Bond (1991), Arellano and Bover (1995), as well as Blundell and Bond (1998). To remove the potential linear correlations between the lagged dependent variables and the individual-specific effects, Arellano and Bond (1991:285) suggested first-differencing of the regression equation. Furthermore, they suggested the use of lagged values of the regressors in levels as instruments in order to overcome the problem of endogeneity. On the other hand, due to the criticism that the difference GMM of Arellano and Bond (1991) could lead to faulty inferences because lagged levels of dependent and explanatory variables are weak instruments if these variables are persistent over time (Blundell & Bond, 1998:118), the system GMM was introduced by Arellano and Bover (1995) and Blundell and Bond (1998), which suggested that both the first-difference and level equations be combined, with the lagged levels of the explanatory variables serving as the instruments for the level equations. Within this framework, the validity of the instruments hinges on the assumption of constancy in the correlation of the country-specific effect and the levels of the regressors over a period.

However, despite adequately overcoming the two major problems of endogeneity and autocorrelation, the GMM estimates are only reliable for models with a large number of cross sections (N) and a small time dimension (T). In a case of small N and large T, or large N and large T, the GMM estimators are likely to generate spurious results because with small N, the autocorrelation test would be unreliable, and in addition, as T increases, the number of instruments increases too, which negatively affects the validity of the Sargan test of over-identifying restrictions, thereby causing unreliable and inconsistent results (Roodman, 2009:128). Further, the GMM assumptions of homogenous slope coefficient and stationarity of variables have also been criticised as being too restrictive. While the former may generate inconsistent, and potentially deceptive estimates, except the when slope coefficients are identical in reality (Pesaran *et al.*, 1999:622), the latter holds mainly because GMM actually captures only the short-run dynamics.

Because the data set for this study consists of N=30, and T=33 dimensions, and considering other demerits of the GMM technique as aforementioned, there exist doubts over the consistency and reliability of GMM estimates for the estimation. To this end, the Panel autoregressive distributed lag (ARDL) technique, developed by Pesaran and Smith (1995) and Pesaran *et al.* (1999) for dynamic panel data models with relatively large T, which is of the same order of magnitude as N (Pesaran *et al.*, 1999:621) was employed for this study. The authors also demonstrated that some modifications to the standard cointegration techniques are able to produce consistent and efficient long-run results for a model containing variables that are either I(0) and/or I(1). In addition, the panel ARDL addresses the problem of endogeneity and is able to handle both the long-run equilibrium and the likely heterogeneous dynamic adjustment process. Following Pesaran *et al.* (1999) and Demetriades and Law (2006), the unrestricted error correction ARDL (p, q) representation of equations (4.21) and (4.23) – (4.29) is as follows:

$$\Delta y_{it} = \vartheta_i y_{i,t-1} + \beta_i' x_{i,t-1} + \sum_{j=1}^{p-1} \varphi_{ij} \Delta y_{i,t-j} + \sum_{j=0}^{q-1} \alpha_{ij}' \Delta x_{i,t-j} + \pi_i + \epsilon_{it}, \qquad i = 1, 2, \dots, N;$$

$$t = 1,2, \dots, T \tag{4.35}$$

where y_{it} is a scalar dependent variable, x_{it} is a vector of independent variables for group i, π_i represents the country-specific effects, ϑ_i is a scalar coefficient of the lagged dependent variable, β_i''s is a vector of coefficients for independent variables, φ_{ij}'s are scalar coefficients of lagged first-differences of dependent variables, α_{ij}''s represent vector of coefficients of first-difference of independent variables and their lagged values, while ϵ_{it}'s are disturbances which are assumed to be independently distributed across i and t, with zero means and variances greater than zero.

Moreover, if $\vartheta_i < 0$ is assumed for all i, and hence, a cointegration between y_{it} and x_{it}, such that:

$$y_{it} = \theta_i' x_{it} + \mu_{it}, \qquad i = 1,2, \dots, N; \quad t = 1,2, \dots, T \tag{4.36}$$

where $\theta_i' = \frac{-\beta_i'}{\vartheta_i}$ is the k X 1 vector of the long-run coefficients, and μ_{it}'s are stationary with possibly non-zero means (including fixed effects) - then, equation (4.35) can be re-written as:

$$\Delta y_{it} = \vartheta_i \mu_{i,t-1} + \sum_{j=1}^{p-1} \varphi_{ij} \Delta y_{i,t-j} + \sum_{j=0}^{q-1} \alpha'_{ij} \Delta x_{i,t-j} + \pi_i + \epsilon_{it} \quad (4.37)$$

where $\mu_{i,t-1}$ is the error correction term obtained through equation (4.36); hence, ϑ_i represents the coefficient of the error correction term, which measures the speed of adjustment towards the long-run equilibrium. Furthermore, ϑ_i is expected to be negative, less than one and statistically significant for a long-run relationship to exist among the variables in the model.

Under the panel ARDL framework, estimation of parameter estimates can be carried out by means of pooled mean group (PMG), mean group (MG) and dynamic fixed effect (DFE) estimators. The PMG estimator was proposed by Pesaran *et al.* (1999) under the assumption of homogeneous long-run slope coefficients for all cross sections; that is, $\theta_i = \theta$ for all i. However, it allows the short-run coefficients, intercepts, and error variances to vary across countries. This estimator is particularly applicable when we have justifiable reason to believe that there is a similarity in the long-run equilibrium relationship across the individual units. Under the PMG, the pooled maximum likelihood estimation computes the individual-unit short-run coefficients and the common long-run coefficients, which are denoted by:

$$\hat{\vartheta}_{PMG} = \frac{\sum_{i=1}^{N} \tilde{\vartheta}_i}{N}, \qquad \hat{\beta}_{PMG} = \frac{\sum_{i=1}^{N} \tilde{\beta}_i}{N}, \qquad \hat{\varphi}_{jPMG} = \frac{\sum_{i=1}^{N} \tilde{\varphi}_{ij}}{N}, \qquad j = 1, \dots, p-1$$

$$\hat{\alpha}_{jPMG} = \frac{\sum_{i=1}^{N} \tilde{\alpha}_{ij}}{N}, \qquad j = 0, \dots, q-1, \qquad \hat{\theta}_{PMG} = \tilde{\theta} \quad (4.38)$$

On the other hand, the MG estimator was introduced by Pesaran and Smith (1995). The MG estimator does not consider the possibility of homogeneity of any coefficients. Put differently, it imposes no restrictions, but operates under the assumption of heterogeneity by allowing all short-run and long-run parameters to vary. The MG estimator operates by estimating one equation for each cross section, and then presents the average of all the parameters. However, for MG estimates to be consistent and valid, there must be sufficiently large N and T data dimensions. The estimates of long-run and short-run parameters under the MG are given as follows:

$$\hat{\vartheta}_{MG} = \frac{\sum_{i=1}^{N} \hat{\vartheta}_i}{N}, \qquad \hat{\beta}_{MG} = \frac{\sum_{i=1}^{N} \hat{\beta}_i}{N}, \qquad \hat{\varphi}_{jMG} = \frac{\sum_{i=1}^{N} \hat{\varphi}_{ij}}{N}, \qquad j = 1, \dots, p-1$$

$$\hat{\alpha}_{jMG} = \frac{\sum_{i=1}^{N} \tilde{\alpha}_{ij}}{N}, \qquad j = 0, \dots, q-1, \qquad \hat{\theta}_{MG} = \frac{1}{N}\sum_{i=1}^{N} -\left(\hat{\beta}_i / \hat{\vartheta}_i\right) \tag{4.39}$$

where $\hat{\vartheta}_i, \hat{\beta}_i, \hat{\varphi}_{ij}$ and $\hat{\alpha}_{ij}$ denote OLS parameters obtained individually from equation (4.35).

The DFE estimator is located in between PMG and MG, in that it constrains both the long-run and short-run coefficients to be the same across the individual units, but allows the intercepts of the cross-sections to vary. It is noteworthy, though, that this estimator might not produce consistent and valid estimates if the sample size is small, in which case it could suffer from simultaneous equation bias arising from endogeneity of the lagged dependent variable with the error term (Blackburne & Frank, 2007:205).

As the sample for this study consists of SSA countries, which are all developing economies, they are expected to exhibit homogeneity as regards economic growth, external debt and quality of institutions. In the short run, though, country-specific heterogeneity cannot be ruled out as a result of the impact of different domestic laws and regulation. To this end, considering the long-run homogeneity assumption, the PMG estimator tends to be more efficient, in comparison to the MG estimator. Furthermore, considering the time dimension for this study, which is 33 years, the MG estimator would be inefficient, because it would suffer from a loss of degrees of freedom. By implication, the PMG appears more appropriate for this study. However, to objectively determine the most consistent and efficient estimator among the three, a Hausman-type test (Hausman, 1978) was employed. The test was conducted under the null hypothesis that the difference between PMG and MG or between PMG and DFE is insignificant. If the probability value is greater than the 5% critical value, then the null hypothesis cannot be rejected, in which case, the PMG estimator is advocated as the efficient estimator. If, contrariwise, the probability value is less than the 5% critical value, then the null hypothesis is rejected in favour of the alternative hypothesis that a significant difference exists between PMG and MG or between PMG and DFE, in which case, the respective MG or DFE is recommended as the efficient estimator.

4.6 CONCLUSION

This chapter has discussed the research methodology for the study which consists of the research design, nature of data, study period and sample selection. The chapter also considered the

theoretical framework from which the estimated models were derived. Further, the several variables employed in the various models in the study were also described, with their selections explained. This was followed by a section describing the descriptive and statistical tests conducted on the variables, such as descriptive statistics, correlation analysis and panel unit root tests. The chapter concluded with a discourse on the estimation technique of panel ARDL employed in the study.

In the next chapter, results from the various estimated models are presented and discussed.

CHAPTER 5

RESULTS AND DISCUSSION

5.1 INTRODUCTION

The primary objective of this study is to examine the relationship between external debt, institutional quality and economic growth in sub-Saharan Africa (SSA). To this end, three empirical objectives are pursued: to examine the nonlinear effect of external debt on economic growth; to investigate the channels of transmission from external debt to economic growth; and to investigate the role of institutional quality in the relationship between external debt and economic growth. This chapter is devoted to the presentation and discussion of results of econometric analyses conducted in order to achieve the aforementioned empirical objectives.

The chapter begins with a trend analysis of the key variables employed in the study. This is followed by a section discussing the nonlinear impact of external debt on economic growth. The subsequent section discusses the channels of transmission from external debt to economic growth. Thereafter, this is followed by the analysis of the role of institutional quality in the external debt-economic growth nexus. In each of the last three sections, not only are the descriptive statistics displayed, but a correlation analysis of the variables used in their respective estimation regressions is also conducted. This is followed by the conducting of panel unit root tests on the same variables in order to establish their integration properties. Afterwards, the results of the panel ARDL estimations are presented and discussed, which is followed by a robustness check of the estimated results. The last section concludes the chapter.

5.2 TREND OF ECONOMIC GROWTH, EXTERNAL DEBT AND INSTITUTIONAL QUALITY IN SSA

The sub-Saharan Africa is a region that is geographically located in the south of the Sahara within the continent of Africa. It comprises 49 countries that are further divided into four sub-regions, namely Central Africa, East Africa, Southern Africa and West Africa. Owing to data constraints, however, our trend analysis is conducted on a sample of 30 SSA countries which cut across the four sub-regions. A list of the countries is available in Appendix 2.

5.2.1 Trend of economic growth in SSA

To analyse the trend of economic growth in the SSA countries, we employ the data on real GDP per capita: Figure 5.1 depicts the trend of the variable for the SSA countries. The real GDP per capita figures between 1985 and 1988 in the region exhibited a negative performance of economic growth, as the region experienced a decline of about 1.2% within the period. This negative economic growth might be attributed to the impact of the severe global economic recession that was experienced in the 1980s, coupled with external shocks from oil and commodity prices which comprised the mainstays of most of these economies. The economies seemed to have recovered from the slumps between 1988 and 1991, as real GDP per capita grew by about 1.6% between the two periods, only for the economies to witness another round of downturn between 1991 and 1995, as the real GDP per capita showed a negative growth of about 7.1%. This massive decline in economic growth for this period could be explained by continued deterioration of terms of trade and export earnings of SSA countries in the aftermath of the mid-1980s global recession and their poor economic performance, arising from the outbreak of political and armed conflicts in several SSA countries.

Economic growth in SSA countries improved between 1995 and 1997 by 5.1%, but it began to decline again until 2000 by about 2.7%. Significant improvement in economic growth was recorded in the following year as the real GDP per capita grew by 0.6% between 2000 and 2001. This upward trajectory continued until 2008, because the real GDP per capita figures demonstrate that the economies witnessed a 1.5% average growth rate between 2000 and 2008. The positive economic performance in SSA during this period could be linked to many factors, notable among which were continuous reforms, improved policies, enhanced investment, debt relief and gains from vast amount of natural resources.

During this period, Botswana and Namibia, for example, witnessed massive expansion of their mineral resources sectors, while Angola, Gabon and Nigeria benefitted greatly from high oil prices and rising production levels. The African Growth and Opportunity Act (AGOA) of the US also helped to galvanise the textile industry of Lesotho and Mauritius. SSA economies during this period were so resilient that the impact of the 2007/2008 global financial crisis was moderate in the region as indicated by a sharp decline of the real GDP per capita by about 1.5% from 2008 to

2009. Following this decline, SSA countries returned to the path of high and sustained economic growth levels, especially between 2010 and 2014, during which the average growth rate of real GDP per capita stood at 3.1%. Though between 2014 and 2017, the economies continued to grow, the increase became slower with each passing year.

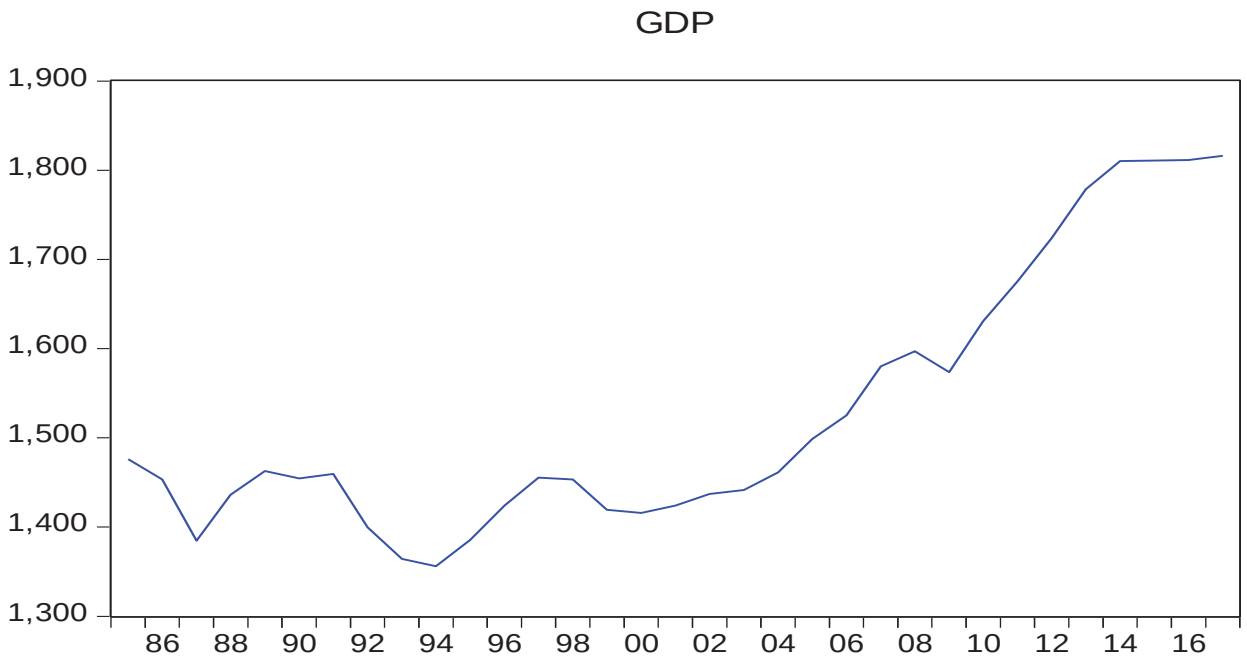

Figure 5.1: Trend of economic growth in SSA

5.2.2 Trend of external debt in SSA

The external debt variable employed in our analysis in this Chapter is external debt as a percentage of GNI. Figure 5.2 presents the trend of the variable for our sample over the study period. The 1980s were remarkable years as regards the external debt profile of SSA, being a period noted for the eruption of the international debt crisis, marked by Mexico's declaration of inability to fulfil her debt obligations in 1982. Hence, external debt in SSA for this period maintained an upward trend. Between 1985 and 1986 alone, external debt as a percentage of GNI in SSA grew from 88.9% to 105.9%, representing a growth rate of 19.2%. This upward trend continued until 1994, though there were reductions in external debt/GNI figures by 4.9% and 0.2% from 1987 to 1988 and from 1990 to 1991, respectively. In absolute terms the figures had moved from 88.9% in 1985 to 180.9% in 1994, indicating that external debt grew by 104.5% between the two periods.

The upward trend of external debt during this period could be attributed to a number of factors which included continued deterioration of SSA's terms of trade and export earnings, following the global economic recession of the 1980s; higher interest rates on accumulated external debt stocks; and debt rescheduling and refinancing, which only culminated in higher external debt figures for SSA. On the other hand, the Figure illustrates that external debt in SSA assumed a downward trend from 1995 to 2012, by which time it had reduced to 28.7%. This reduction could be largely attributed to the HIPC initiative of the IMF and the World Bank, which was aimed at reducing the level of indebtedness of the world's poorest and most indebted nations.

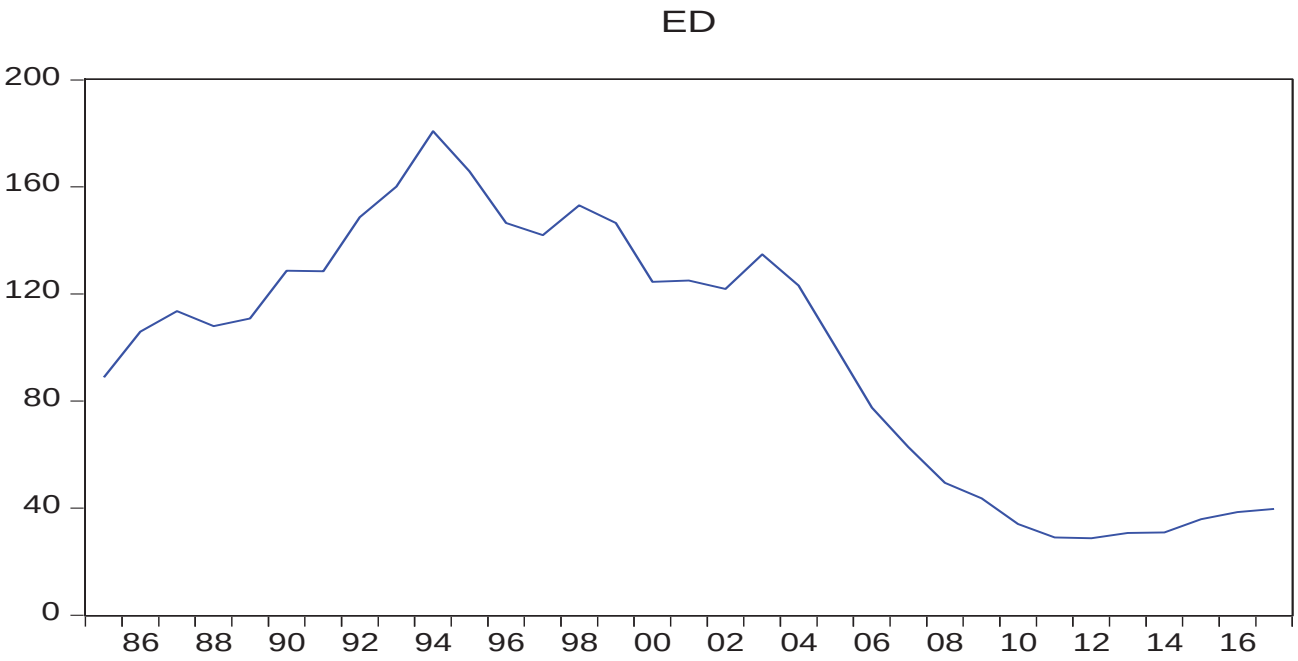

Figure 5.2: Trend of external debt in SSA

The reductions could also be credited to the implementation of the MDRI by the IMF and AfDB in 2006, which achieved great results in reducing external debt stock of SSA countries, though not in absolute terms of the external debt stocks. This is because though total external debt declined between 1995 and 2000, it actually assumed an upward trend from 2000 onwards as illustrated in Figure 3.1 in Chapter 3. This upward movement was not reflected in the external debt/GNI figures as SSA countries witnessed huge improvement in their national income figures as reflected in Figure 5.1 for GDP. From 2013 to 2017, the external debt/GNI figures exhibit a disturbing trend because external debt in SSA assumed another round of upward movement, despite the various

efforts in the past that were aimed at reducing the burden of external debt in these countries. In absolute terms external debt/GNI increased from 30.8 in 2013 to 39.7 in 2017, which represents a 28.9% growth rate between the two periods.

5.2.3 Trend of institutional quality in SSA

In analysing the trend of institutional quality for SSA countries, six measures of institutional quality, drawn from the ICRG database, published by the PRS group were employed. They are: bureaucratic quality (range: 0-4), corruption (range: 0-6), investment profile (range: 0-12), law and order (range: 0-6), democratic accountability (range: 0-6) and government stability (range: 0-12). Using the institutional quality factors from the ICRG is quite valuable because they capture every facet of domestic institutional structure, as opposed to indicators used in some other studies which rely mainly on colonialism, geography and linguistic fractionalisation. In addition, the ICRG data are compiled based on a consistent pattern of evaluation using political information as well as economic and financial data from each country. A composite index of institutional quality was constructed from these six variables after rescaling each of them to range from zero to ten, so as to enable comparability. Figure 5.3 depicts the trend of institutional quality in the region, based on the composite index.

Institutional quality in SSA reflects a stable and steadily growing trend in the 1980s since there was a low risk of internal conflict in the countries, while there were concerted efforts by all and sundry to overcome the twin problems of poverty and global economic recession. During this period, the index rose from 4.12/10 in 1985 to 4.33/10 in 1989, indicating a growth rate of about 5.1% over the period. Between 1989 and 1993, there was a decline in the institutional quality index from 4.33/10 to 4.04/10, indicating a negative growth rate of 6.7%. This period was bedevilled by government instability in several countries within the region as there were a series of military takeovers of governments, which were accompanied by social unrest.

Meanwhile, institutional quality in the region returned to the path of slow, steady and sustained growth in 1993 all the way to 1999, when it attained a score of 5.1/10, indicating that institutional quality grew by a massive 24.4% between the two periods. This impressive improvement in the institutional quality of SSA could be attributed to conscious efforts made by most of the countries to improve the quality of their institutions through reforms, as one of the eligibility criteria set out

in the IMF and World Bank's HIPC initiative for debt relief was that of having a good record of reforms through IMF- and IDA-supported programmes (World Bank, 2010:31). This trend was maintained until 2007, though in a fluctuating manner when the score stood at 5.09/10. Beyond 2007, however, the trend of institutional quality assumed a slow and steady decline up till 2017 when the index stood at 4.69/10. This indicates that within the ten-year period, the composite index of institutional quality recorded a negative growth rate of about 7.7%.

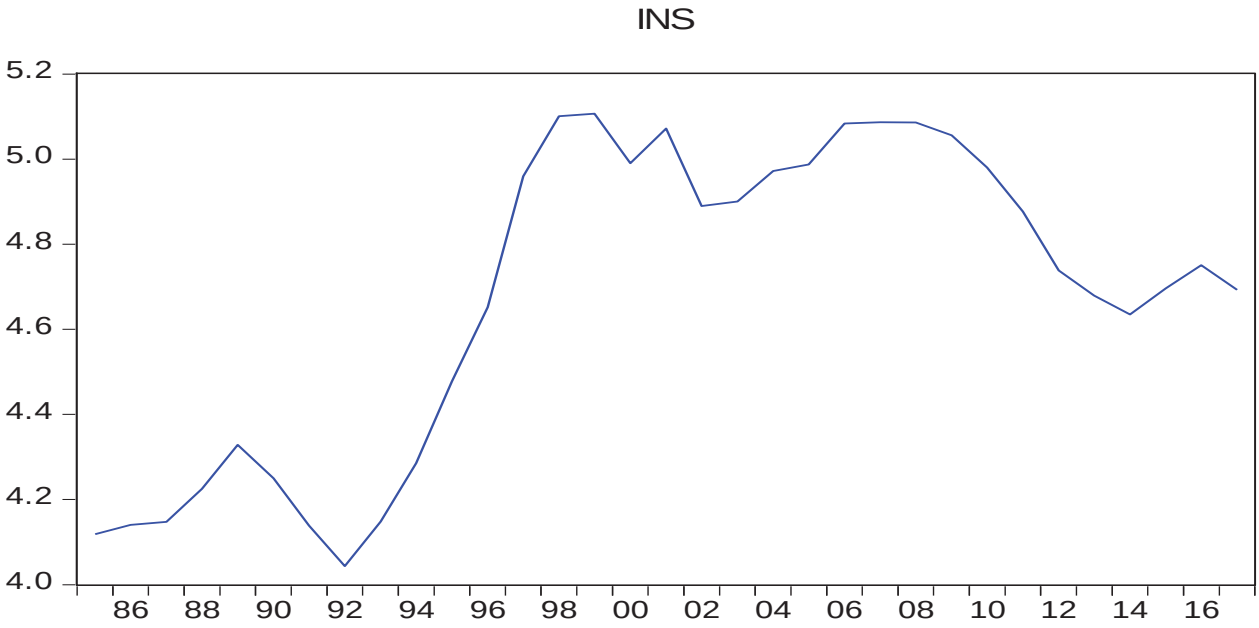

Figure 5.3: Trend of institutional quality in SSA

5.3 NONLINEAR EFFECT OF EXTERNAL DEBT ON ECONOMIC GROWTH IN SUB-SAHARAN AFRICA

In this section, the results of panel ARDL models estimated to investigate the nonlinear effect of external debt on economic growth are presented and discussed. The discussion begins with an analysis of descriptive statistics of all the variables employed in the various models. This is followed by a report of the correlation between the variables under study. A presentation of the results of panel unit root tests conducted on the variables is also made in the section, before holding a discussion of the panel ARDL results. The section is concluded with the results of the robustness tests conducted on the panel ARDL results.

5.3.1 Descriptive statistics

The descriptive statistics of the variables in our model are presented in Table 5.1. The mean GDP per capita for the study period stands at $1527, while those of the external debt variables stand at 98.8% of GNI, 402.4% of export, $7.8billion, and 5.6% of exports for external debt/GNI, external debt/export, total external debt and external debt interest payments/export, respectively. The average institutional quality index for the entire sample is 4.68/10. Investment, trade openness and life expectancy averaged out at 20% of GDP, 63.7% of GDP and 53.8, respectively. Furthermore, the variance is quite large for each of the variables, as reflected by the huge differences in their respective maximum and minimum values. This is further established by the rather large standard deviation statistic for each variable.

Table 5.1: Summary of descriptive statistics

Variable	Mean	Std. Deviation	Minimum	Maximum	Observations
GDP	1527.19	2155.93	131.65	12042.43	990
EDG	98.76	128.15	3.90	1380.77	990
EDX	402.41	555.01	6.26	4245.39	962
EDT	7,800,000,000	14,600,000,000	245,000,000	176,000,000,000	977
EDI	5.57	5.99	0.08	43.83	879
IQ	4.68	1.13	0.53	7.36	990
INV	20.22	8.64	-2.42	74.61	990
HC	53.75	6.29	35.71	67.15	990
TRD	63.66	30.49	9.14	311.35	990

Note: GDP=GDP per capita (constant 2010US$); EDG=External debt as a percentage of GNI; EDX=External debt as a percentage of export; EDT=Total external debt stocks (current US$); EDI=Interest payment on external debt as a percentage of export; IQ=Composite index of institutional quality; INV=Gross fixed capital formation as a percentage of GDP (proxy for investment); HC=Life expectancy at birth (proxy for human capital); TRD=Trade openness as a percentage of GDP

5.3.2 Correlation analysis

Correlation analysis is usually employed to numerically establish the degree of association, which could either be positive or negative, between two or more variables. A positive (negative) and closer to one correlation indicates a strong positive (negative) relationship between the variables, while a positive (negative) and further from one correlation implies a weak positive (negative)

association between them. A correlation with a value of zero, however, indicates no association between the variables. The correlation matrix of the variables used in this section's model estimation is presented in Table 5. 2.

Table 5.2: Correlation matrix

	GDP	EDG	EDX	EDT	EDI	IQ	INV	HC	TRD
GDP	1								
EDG	-0.13	1							
EDX	-0.24	0.37	1						
EDT	-0.34	0.08	0.07	1					
EDI	-0.13	0.26	0.5	0.05	1				
IQ	0.26	-0.38	-0.43	-0.08	-0.23	1			
INV	0.23	-0.08	-0.14	-0.09	-0.11	0.17	1		
HC	0.29	-0.28	-0.35	-0.11	-0.42	0.32	0.24	1	
TRD	0.27	-0.26	-0.29	-0.11	-0.24	0.12	0.22	0.2	1

Note: GDP=GDP per capita (constant 2010US$); EDG=External debt as a percentage of GNI; EDX=External debt as a percentage of export; EDT=Total external debt stocks (current US$); EDI=Interest payment on external debt as a percentage of export; IQ=Composite index of institutional quality; INV=Gross fixed capital formation as a percentage of GDP (proxy for investment); HC=Life expectancy at birth (proxy for human capital); TRD=Trade openness as a percentage of GDP

In general, the matrix affirms that while some variables exhibit positive association with real GDP per capita, few others exhibit negative association with it. Specifically, institutional quality composite index, gross fixed capital formation, life expectancy at birth and trade openness all indicate positive association with real GDP per capita, while all the four external debt variables show signs of negative association with real GDP per capita

5.3.3 Panel unit root tests

In order to determine the integration property of each variable in our model, three panel unit root tests were employed: the Levin *et al.* (2002) test, the Im *et al.* (2003) test and the ADF Fisher test (suggested by Maddala and Wu (1999)). Table 5.3 reports the test statistic and the probability values for the panel unit root tests for each of the variables. In the Table, the results of the LLC tests are presented in columns 2 and 3, while those of the IPS are in columns 4 and 5. Moreover, the results of the ADF Fisher tests are presented in the last two columns. Each of the three panel

unit root tests operates under the null hypothesis that the series contain unit root; hence, if the probability value of the test statistic is less than the 5% critical value, then the null hypothesis is rejected and it is adjudged that the variable is stationary. If, contrariwise, the value of the test statistic's probability is greater than the 5% critical value, the variable is adjudged non-stationary.

Table 5.3: Panel unit root tests

Variable	LLC test		IPS test		ADF Fisher test	
	Level	First Difference	Level	First Difference	Level	First Difference
LGDP	1.2205 (0.8889)	-6.6248*** (0.0000)	4.0335 (1.0000)	-10.744*** (0.0000)	50.9647 (0.7906)	240.368*** (0.0000)
EDG	-0.1622 (0.4356)	-13.774*** (0.0000)	1.7675 (0.9614)	-14.761*** (0.0000)	41.5849 (0.9664)	327.399*** (0.0000)
EDG2	-2.2411** (0.0125)	-16.793*** (0.0000)	-1.1111 (0.1333)	-17.781** (0.0000)	84.5164** (0.0202)	398.235*** (0.0000)
EDX	-0.6694 (0.2516)	-10.962*** (0.0000)	1.0334 (0.8493)	-14.625*** (0.0000)	40.4984 (0.9749)	324.447*** (0.0000)
EDX2	-1.761*** (0.0039)	-12.030*** (0.0000)	-1.0749 (0.1412)	-17.491*** (0.0000)	70.4867 (0.1669)	396.728*** (0.0000)
LEDT	1.3332 (0.9098)	-12.205*** (0.0000)	0.9987 (0.8410)	-12.855*** (0.0000)	54.9079 (0.6618)	278.955*** (0.0000)
LEDT2	1.5356 (0.9377)	-12.197**** (0.0000)	1.1818 (0.8814)	-12.718*** (0.0000)	53.8788 (0.6976)	275.827*** (0.0000)
EDI	-4.3088*** (0.0000)	-12.935*** (0.0000)	-1.2023 (0.1146)	-18.287*** (0.0000)	65.0581 (0.2445)	406.582*** (0.0000)
EDI2	-5.768*** (0.0000)	-16.545*** (0.0000)	-3.844*** (0.0001)	-21.791*** (0.0000)	102.536*** (0.0000)	498.144*** (0.0000)
IQ	-15.397*** (0.0000)	-15.397*** (0.0000)	-14.254*** (0.0000)	-14.254*** (0.0000)	312.218*** (0.0000)	312.218*** (0.0000)
INV	-2.599*** (0.0047)	-11.258*** (0.0000)	-2.764*** (0.0029)	-15.179*** (0.0000)	96.5374*** (0.0019)	319.522*** (0.0000)
HC	-23.276*** (0.0000)	-7.195*** (0.0000)	-9.192*** (0.0000)	-12.833*** (0.0000)	517.970*** (0.0000)	521.457*** (0.0000)
TRD	1.0580 (0.8550)	-11.353*** (0.0000)	-1.0558 (0.1455)	-15.349*** (0.0000)	70.1883 (0.1731)	324.427*** (0.0000)

Note: Figures in parenthesis indicate probability values ** and *** represent significance at 5% and 1%, respectively; LLC=Levin, Li and Chu; IPS=Im, Pesaran and Shin; ADF=Augmented Dickey-Fuller; LGDP=Log of GDP per capita ; EDG=External debt as a percentage of GNI; EDG2=Squared term of external debt as a percentage of GNI; EDX=External debt as a percentage of export; EDX2= squared term of external debt as a percentage of export; LEDT=Log of total external debt stocks; LEDT2=Squared term of log of total external debt stocks ; EDI=Interest payment on external debt as a percentage of export; EDI2=Squared term of interest payment on external debt as a percentage of export; IQ=Composite index of institutional quality; INV=Gross fixed capital formation as a percentage of GDP (proxy for investment); HC=Life expectancy at birth (proxy for human capital); TRD=Trade openness as a percentage of GDP

As indicated in the Table, the test statistic and the respective probability values of the variables show that while some variables are stationary at level, several others become stationary, only at first difference. For example, all the three tests are in agreement that variables such as the squared

term of interest payment on external debt/export, institutional quality index, investment and human capital are stationary at levels, while on the other hand, variables like log of GDP per capita, external debt/GNI, external debt/export, log of total external debt and its squared term and trade openness are all adjudged to be stationary at first difference. All the remaining variables are also adjudged to be either I(0) or I(1) by each of the panel unit root tests. These results indicate that we have a case of mixed stationarity of variables at level and first difference, and that makes the panel ARDL approach very suitable for the estimation.

5.3.4 Estimation and discussion

In order to investigate the nonlinear effect of external debt on economic growth in SSA countries, a panel ARDL approach, suggested by Pesaran and Smith (1995) and Pesaran *et al.* (1999) is employed to estimate equation 4.21. The panel ARDL approach enables the estimation of the equation by three different estimators: the pooled mean group (PMG) estimator proposed by Pesaran *et al.* (1999), the mean group (MG) estimator developed by Pesaran and Smith (1995), and the dynamic fixed effects (DFE) estimator. Table 5.4 reports the results of the panel ARDL estimation based on the three estimators. The results for the PMG estimator are contained in columns 2 and 3, while those of the MG estimator are in columns 4 and 5. Furthermore, the results of the DFE estimator are to be found in columns 8 and 9.

As the sample consists of SSA countries, which are all developing economies, they are expected to exhibit homogeneity as regards economic growth, external debt and quality of institutions. In the short run, though, country-specific heterogeneity cannot be ruled out as a result of the impact of different domestic laws and regulations. To this end, considering the long-run homogeneity assumption, the PMG estimator tends to be more efficient, in comparison to the MG and DFE estimators. Furthermore, considering the time dimension for this study, which is 33 years, the MG estimator would be inefficient, because it would suffer from too few degrees of freedom. By implication, the PMG appears more appropriate for this study. However, to objectively determine the most consistent and efficient estimator among the three, a Hausman-type test (Hausman, 1978) is employed. The test is conducted under the null hypothesis that the difference between PMG and MG or between PMG and DFE is insignificant. If the probability value is greater than the 5% critical value, then the null hypothesis cannot be rejected, in which case, the PMG estimator is

advocated as the efficient estimator. If, contrariwise, the probability value is less than the 5% critical value, then the null is rejected in favour of the alternative hypothesis that a significant difference exists between PMG and MG or between PMG and DFE, in which case, the respective MG or DFE is recommended as the efficient estimator.

The results of the Hausman tests conducted on the model are provided in columns 6 and 7 of Table 5.4. The result of the null hypothesis test, that there is no significant difference between PMG and MG, indicates that the null cannot be rejected, as the probability value is greater than the 5% critical value. Hence, the PMG is recommended as the more efficient estimator over the MG. Further, the PMG is adjudged efficient, compared to the DFE, based on the probability value of the result of the null hypothesis that there is no significant difference between PMG and DFE, which is also greater than 5%, in which case we cannot reject the null. Based on the results of the Hausman tests conducted, we conclude that the PMG estimator provides the much required consistent and efficient estimates of the parameters in the model, and will therefore form the basis of analysis of the estimates.

The long-run results of the PMG estimator are recorded in columns 2 and 3 of the Table, with log of real GDP per capita as the dependent variable and external debt as a percentage of GNI as the external debt variable. From the results, the coefficients of both the external debt variable and its squared term are statistically significant at the 1% level and bear opposite signs. This result indicates that external debt has a nonlinear impact on economic growth in the sampled countries over the study period. It also establishes that the relationship between external debt and economic growth in our sample follows an inverted U-shaped pattern. These results imply that external debt has dual impacts on economic growth in SSA, in which case, external debt stocks at moderate levels drive economic growth, before depressing it after crossing a particular threshold. Specifically, *ceteris paribus*, at moderate levels of external debt, a unit increase in external debt enhances economic growth by about 0.26% and vice-versa, while on the other hand, at high levels of external debt beyond the threshold, a unit increase in external debt depresses economic growth by about 0.003% and vice versa.

This finding is further instructive of the fact that a reduction in external debt stock could enhance economic growth within the region, as a 10-unit reduction in external debt accumulation, for

example, would drive growth by 0.03%, going by the estimates. This result corroborates Dogan and Bilgili (2014:216), Imbs and Ranciere (2005:3), Ouedraogo (2015:137) and Pattillo *et al.* (2011:20) who claim that the relation between external debt and economic growth is nonlinear and follows an inverted U-shaped pattern in their studies of Turkey, 87 developing countries, six West African countries and 91 developing countries, respectively. It also supports Drine and Nabi (2010:492) who suggest that external debt has a nonlinear impact on production efficiency in their sample of 27 developing countries.

On the other hand, the results contradict those of Schckarek (2004:10) and Schclarek and Ramon-Ballester (2005:12) who investigated the nonlinear effect of external debt on GDP growth in a panel study for 59 developing countries and 20 Latin America and Caribbean countries, respectively, by using several measures of external debt. Results from their estimations imply that the relationship between external debt and economic growth does not follow a nonlinear pattern. Further, results from both the MG and DFE estimators as presented in columns 4-5, and columns 8-9, respectively contradict the findings from our PMG estimator, as both deny the existence of nonlinear relation between external debt and economic growth. Rather, they both suggest that external debt has a negative impact on economic growth in the long-run at 10% and 5% significance levels, respectively.

The dual impacts of external debt on economic growth, and the consequent inverted U-shaped relation between the two variables, as indicated in the PMG estimation, suggests the existence of an optimum threshold of external debt beyond which it becomes deleterious to economic growth. This threshold of external debt is determined by solving equation (4.22), in which case we obtain 43% of GNI (0.002598/0.00006 = 43.3) for the sample under study. This result indicates that external debt drives economic growth in SSA when it lies below 43% of GNI, but it becomes deleterious to growth when it exceeds 43% of GNI. Based on this result, SSA countries would find their external debt stock beneficial to their economies if they could keep it below this threshold. For example, Table 5.1 shows that the average external debt stocks/GNI in our sample stands at 98.76, which far exceeds the threshold. This indicates most SSA countries hold external debt stocks in excess of this threshold. Moreover, results from previous studies have also proposed different thresholds of external debt beyond which the latter becomes deleterious to economic growth. For example, while Imbs and Ranciere (2005:3) suggest a threshold for external debt stock

at 55-60% of GDP for developing countries, Ouedraogo (2015:138) and Pattillo *et al.* (2011:22) estimate the threshold at 51% of GDP and 35-40% of GDP for West African and developing countries, respectively.

The coefficient of institutional quality index in our PMG estimation is positive and statistically significant at 1% level of significance, which indicates that institutional quality promotes economic growth. This result is in line with findings in some previous studies (Acemoglu *et al.*, 2002:1231; Acemoglu *et al.*, 2005:462; Borrmann *et al*., 2006:360; Ouedraogo, 2015:137; Rodrik, 1998:12; Rodrik *et al*., 2004:137; Vitola & Senfelde, 2015:277) who argue that institutions play a pivotal role in the attainment of long-run economic growth across the world. This result is also corroborated by the DFE estimation.

Investment is reported to affect economic growth positively, going by the positive value and significance of its coefficient at the 1% level. This finding supports Ouedraogo (2015:137), Pattillo *et al.* (2011:15) and Schclarek and Ramon-Ballester (2005:28) who submit that investment has a positive effect on economic growth. This finding also holds true in both the MG and DFE results, as reported in the Table. Furthermore, human capital follows suit with positive and statistically significant coefficient in both the PMG and DFE models thereby indicating that more improved and increasing levels of human capital are associated with higher levels of economic growth. This finding is in line with the proposition of the endogenous growth theory that human capital stock is pivotal in the developmental process of an economy (Lucas, 1988:19; Romer, 1986:1006). It also corroborates the position of some previous findings (Anwar & Cooray, 2012:979; Law *et al.*, 2018:19) which suggests that improvement in human capital stimulates economic growth and vice-versa.

Another very important result stemming from the Table is that of the error correction term (ECT), which, in addition to determining cointegration among the variables, also serves to measure the speed of adjustment from deviation in the short run to long-run equilibrium. The coefficient of the ECT is expected to be negative, less than one and statistically significant if the variables in the model are to be adjudged cointegrated and if previous errors are to be corrected. From the Table, the ECT is indicated to be negative, less than one and significant at the 1% level in all the three estimations. This implies that a long-run relationship exists among all the variables in our models,

and that equilibrium of the PMG model is restored at a rather slow speed of 5.4%. The ECT for the MG and DFE estimators is equally negative, less than one and insignificant at the 1% level.

On the short-run results as presented in the Table, both the external debt variable and its squared term bear negative signs and are statistically insignificant, according to the PMG results. By implication, not only does this result deny the existence of a nonlinear relationship between external debt and economic growth in the short run, it also implies that external debt has no impact on economic growth in the short run. The results also indicate that both institutional quality and investment likewise have no effect on economic growth in the short run, going by the insignificance of their respective coefficients. The DFE estimator, however, refutes the result of the institutional quality index, since it reports its coefficient as positive and significant at 1%. Lastly, human capital is found to be positive and significant at the 10% level, indicating that human capital impacts economic growth positively in the short run.

Table 5.4: Growth model: Panel ARDL nonlinear estimations

Variable	Pooled Mean Group		Mean Group		Hausman test		Dynamic Fixed Effect	
	Coefficient	Std. Error	Coefficient	Std. Error	h-test	p-value	Coefficient	Std. Error
Long-run coefficients								
ED	0.002598***	0.000820	-0.014176*	0.007300			-0.0034**	0.001069
$(ED)^2$	-0.00003***	0.000004	0.000216	0.000169			4.03E-06	2.52E-06
IQ	0.025096***	0.010923					0.1300***	0.036056
INV	0.039407***	0.004921	0.019514**	0.008897			0.0121***	0.003977
HC	0.026099***	0.004682					0.0142**	0.007207
TRD			0.001357	0.002953				
MG vs PMG					6.06	0.1089		
DFE vs PMG					0.03	1.0000		
ECT	-0.0537***	0.016719	-0.1802***	0.041646			-0.074***	0.009368
Short-run coefficients								
ΔED	-0.000562	0.0004581	0.000200	0.000309			-0.00016	0.0001174
$\Delta(ED)^2$	-0.000006	0.0000036	-0.000014	0.000010			-1.60E-07	2.09E-07

Variable	Pooled Mean Group		Mean Group		Hausman test		Dynamic Fixed Effect	
	Coefficient	Std. Error	Coefficient	Std. Error	h-test	p-value	Coefficient	Std. Error
ΔIQ	0.010526	0.0069719					0.01399***	0.00514
ΔINV	-0.000289	0.0007465	-0.000255	0.000758			0.00019	0.00039
ΔHC	0.025677*	0.0146075					0.00752**	0.00319
ΔTRD			-0.000105	0.000384				
Observations	990		990				990	

Note: Dependent variable=Log of GDP per capita; *, ** and *** represent significance at 10%, 5% and 1%, respectively; ED=External debt as a percentage of GNI; ED2=Squared term of external debt as a percentage of GNI; IQ=Composite index of institutional quality; INV=Investment; HC= Human capital); TRD=Trade openness as a percentage of GDP; ECT=Error correction term

5.3.5 Robustness checks

In this section, different measures of external debt are employed to test the robustness of the estimated PMG results. The measures of external debt employed comprise external debt as a percentage of export, interest payment on external debt as a percentage of export, as well as total external debt stocks. Three different panel ARDL models with PMG estimator were estimated, with each using a different measure of external debt to examine the sensitivity of our results to alternative proxies of external debt. Table 5.5 reports the results of the three estimated models. Columns 2 and 3 contain the results of the model with external debt as a percentage of export as the external debt variable. From the long-run results, the coefficients of the external debt variable and its squared term are both statistically significant at the 1% level. Moreover, they carry opposite signs, in which case the former carries a positive sign, while the latter carries a negative sign, thereby suggesting that the impact of external debt on economic growth is nonlinear. It also suggests that the relationship between the two variables follows an inverted U-shaped pattern.

Furthermore, the threshold of external debt beyond which external debt becomes deleterious to economic growth is computed at 306% of export (0.001231/0.00000402 = 306.2). This result implies that for external debt to enhance economic growth in SSA, it must be kept at levels below 306% of export. As evident from Table 5.1, the average external debt stocks/export in our sample stands at 402.41, which far outweighs the threshold. This indicates that most SSA countries hold external debt stocks in excess of this threshold. Furthermore, the coefficients of institutional quality index, investment and human capital are positive and statistically significant at the 1%

level, thereby indicating that each of these variables has a positive effect on economic growth in the long run.

The ECT for the model is negative, less than one and statistically significant at the 5% level, confirming cointegration among the variables. It also indicates that the model converges to a long-run equilibrium at a meagre 3.5% speed of adjustment. For the short-run results, the external debt variable and its squared term are both insignificant, which indicates that external debt has no impact on economic growth in the short run. The same applies to investment, which has an insignificant coefficient in the short-run result. Meanwhile, the coefficients of institutional quality and human capital are positive and significant at the 10% and 5% levels, respectively. This suggests that the two variables affect economic growth positively in the short run.

The results of the second model with interest payment as a percentage of export as the external debt variable are presented in columns 4 and 5 of the Table. These results confirm that the coefficients of the external debt variable and that of its squared term carry opposite signs and are both significant at the 1% level. This result suggests that external debt has a nonlinear effect on economic growth. It also implies the existence of an inverted U-shaped relationship between the two variables, with the threshold beyond which external debt begins to depress economic growth being computed at interest payment on external debt of 34% of export (0.0017206/0.000502 = 34.3). This result indicates that at any level of interest payment on such debt beyond 34% of export, external debt becomes deleterious to economic growth. Hence, for such debt to enhance economic growth in SSA, it must be maintained at levels where interest payment falls below the threshold. As recorded in Table 5.1, the average interest payment on external debt stocks/export in the sample stands at 5.57, which falls below the threshold. This indicates that interest payment on external debt by most SSA countries fall below the threshold.

The ECT for the model is negative, less than one and significant at the 1% level. This confirms that a long-run association exists among the variables in the model, with correction of previous errors occurring at a very slow speed of about 1%. For the short-run results, both the external debt variable and its squared term are insignificant. This implies that in the short run, external debt has no impact on economic growth. The same applies to both institutional quality index and investment, as the coefficients of these control variables are also insignificant, indicating that they

have no impact on economic growth in the short run. However, the coefficient of human capital is positive and statistically significant at 1% level of significance. This suggests that human capital exerts a positive effect on economic growth in the short run.

Furthermore, the results of the third model with total external debt stocks as the external debt variable are presented in columns 6 and 7 of the Table. From the long-run results, the external debt variable and its squared term are both significant at the 1% level. Moreover, the two variables bear opposite signs, with the former carrying a positive sign, while the latter carries a negative sign. This suggests that the impact of external debt on economic growth is nonlinear and that the relationship between the two variables is inverted U-shaped or concave in nature. In line with equation 4.22, the threshold of external debt beyond which economic growth is hampered is computed at \$5.1billion$\left(e^{\left(\frac{1.77734}{0.07951}\right)} = 5{,}087{,}233{,}484.48\right)$. This result implies that at any external debt stocks level below \$5.1billion, economic growth is enhanced in SSA, but any external debt level above the threshold slows down the growth of the economies. As recorded in Table 5.1, the average total external debt stocks in our sample stand at \$7.8b, which far outweighs the threshold value. This indicates most SSA countries hold external debt stocks in excess of this threshold. Further, the coefficients of institutional quality index and investment are positive and statistically significant at the 1% level, while that of human capital is also significant and positive at 5%. These results imply that in the long run, an increase in these variables stimulate economic growth in SSA. On the other hand, the coefficient of human capital is positive and statistically insignificant.

The error correction coefficient in the model is negative, less than one, and significant at 1% significance level. This result suggests the existence of cointegration among the variables in the model. It also indicates that the model would eventually converge to a long-run equilibrium after any disequilibrium in the short run, with the speed of adjustment estimated at about 4.8%. For the short-run results, the two external debt variables turn out to be insignificant. This implies that in the short run, external debt has no impact on economic growth. In addition, investment follows the same pattern with negative and insignificant coefficient. On the other hand, the coefficients of institutional quality index and human capital are positive and significant at 5% level of significance. This suggests that an increase in the values of both variables stimulate economic growth in the short run.

Overall, the principal findings of the study remain fundamentally unchanged when the results of the main regression as presented in Table 5.4 are juxtaposed with those of the robustness tests in Table 5.5. This confirms that this study's results are robust as regards the choice of external debt proxy.

Table 5.5: Growth model: Robustness test

Variable	ED = External Debt/Export		ED = Interest payment/Export		ED = Log of total external debt	
	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
Long-run coefficients						
ED	0.001231***	0.000343	0.017206***	0.005393	1.77734***	0.635948
$(ED)^2$	-2.01E-06***	5.27E-07	-0.000251***	0.000085	-0.039754***	0.014085
IQ	0.0079478***	0.001998	0.010363***	0.002756	0.060378***	0.019276
INV	0.0429334***	0.006025	0.059998***	0.008294	0.046387***	0.005850
HC	0.0305368***	0.004676	0.023602***	0.004551	0.009174**	0.003554
ECT	-0.0347**	0.013994	-0.0098***	0.001501	-0.0482***	0.014299
Short-run coefficients						
ΔED	-0.000303	0.000278	-0.003279	0.005242	-0.994794	0.911133
$\Delta(ED)^2$	1.84E-06	2.18E-06	0.000274	0.000781	0.022949	0.020137
ΔIQ	0.011452*	0.005888	0.012253	0.007634	0.015501**	0.006471
ΔINV	0.000264	0.000731	0.000301	0.000765	-0.000320	0.000724
ΔHC	0.013504**	0.006412	0.016562***	0.005555	0.016492**	0.006576
Observations	960		863		947	

Note: Dependent variable=Log of GDP per capita; *, ** and *** represent significance at 10%, 5% and 1%, respectively; ED=External debt variable; ED2=Squared term of external debt variable; IQ=Composite index of institutional quality; INV=Investment; HC= Human capital); ECT=Error correction term

5.4 CHANNELS FOR THE IMPACT OF EXTERNAL DEBT ON ECONOMIC GROWTH

Another crucial issue relates to the channels through which external debt is likely to transmit its nonlinear impact to economic growth. In the literature, a number of channels have been investigated, which include investment, total factor productivity, interest rate and savings (Checherita-Westphal & Rother, 2012; Pattillo *et al.*, 2004; Riffat & Munir, 2015; Schclarek, 2004). To this end, this section is devoted to the investigation of each of these variables as a

channel of transmission from external debt to economic growth in SSA. In order to do this, the variable under consideration is employed as a dependent variable, with the external debt variable and its squared term, alongside other control variables, as the explanatory variables.

The section begins with the analysis of a summary of descriptive statistics of all the variables employed in all the estimated models. This is followed by a correlation analysis of the variables. Further, panel unit root tests are conducted on all the variables to ascertain their statistical properties and consequently, the suitability or otherwise of the estimation technique. After this, we conduct panel ARDL estimations of each of the models to establish whether the variables act as channels of transmission or not. Each panel ARDL estimation is subsequently followed by the performing of robustness checks on its results.

5.4.1 Descriptive statistics

A summary of descriptive statistics of all the variables employed in all the models in this section is reported in Table 5.6. The mean GDP per capita for the sample is $1527.19. The highest GDP per capita of $12042.43 was recorded by Gabon as far back as 1985, while the lowest figure of $131.65 was recorded by Mozambique in 1986. The external debt variables peaked at 1380.77/GNI, 4245.39/export and 43.83/export for external debt/GNI, external debt/export and interest payment/export and were recorded by Liberia (2003), Sudan (1993) and by Guinea-Bissau (1987), respectively. The average values of private investment, public investment, total factor productivity, interest rate and saving are 12.52/GDP, 8.64/GDP, 0.99, 25.23 and 14.15/GDP. By and large, the variance is quite large for each of the variables, as reflected by the huge differences between their respective maximum and minimum values. This is further reinforced by the rather large standard deviation statistic for each variable.

Table 5.6: Descriptive statistics

Variable	Mean	Std. Deviation	Minimum	Maximum	Observations
GDP	1527.19	2155.93	131.65	12042.43	990
GDPG	3.85	5.05	-30.15	26.85	968
EDG	98.76	128.15	3.89	1380.77	990
EDX	402.41	555.01	6.26	4245.39	962
EDI	5.57	5.99	0.08	43.83	879
PRI	12.52	6.54	-4.08	50.16	851

Variable	Mean	Std. Deviation	Minimum	Maximum	Observations
PUI	8.64	9.25	0	74.61	990
TFP	0.99	0.19	0.41	1.71	861
INT	25.23	59.93	4.74	1175	906
SAV	14.15	11.02	-30.11	53.22	928
IQ	4.68	1.13	0.53	7.36	990
INV	20.22	8.64	-2.42	74.61	990
HC	53.75	6.29	35.71	67.15	990
TRD	63.66	30.49	9.14	311.35	990
POP	2.74	0.84	-1.84	7.85	990
INF	65.48	855.41	-11.69	23773.13	943

Note: GDP=GDP per capita (constant 2010US$); GDPG=Growth rate of GDP (annual %); EDG=External debt as a percentage of GNI; EDX=External debt as a percentage of export; EDI=Interest payment on external debt as a percentage of export.; PRI=Gross fixed capital formation, private sector (proxy for private investment) ; PUI=Gross fixed capital formation, public sector (proxy for public investment); TFP=Total factor productivity; INT=Real interest rate; SAV=Gross saving as a percentage of GDP; IQ=Composite index of institutional quality; INV=Gross fixed capital formation as a percentage of GDP (proxy for investment); HC=Life expectancy at birth (proxy for human capital); TRD=Trade openness as a percentage of GDP; INF=Inflation rate

5.4.2 Correlation analysis

Table 5.7 depicts the correlation matrix of the variables in the estimated models for this section. As illustrated in the matrix, all the variables are associated with GDP per capita. While some are positively related to GDP per capita, the remaining are negatively related to it. For example, variables such as external debt/GNI, external debt/export, external debt interest payment/export, real interest rate, population growth rate and inflation rate all have negative association with GDP per capita. On the other hand, private investment, public investment, total factor productivity, gross savings, institutional quality index, total investment, human capital and trade openness are positively correlated with GDP per capita.

Table 5.7: Correlation matrix

	GDP	GDPG	EDG	EDX	EDI	PRI	PUI	TFP	INT	SAV	IQ	INV	HC	TRD	POP	INF
GDP	1.00															
GDPG	-0.14	1.00														
EDG	-0.08	-0.20	1.00													
EDX	-0.36	-0.17	0.77	1.00												
EDI	-0.02	-0.21	0.67	0.64	1.00											
PRI	0.31	0.04	-0.07	-0.07	-0.10	1.00										
PUI	0.01	0.27	-0.24	-0.28	-0.23	0.09	1.00									
TFP	0.10	0.22	-0.26	-0.24	0.05	-0.08	0.03	1.00								
INT	-0.06	-0.13	0.51	0.31	0.29	0.07	0.13	-0.33	1.00							
SAV	0.53	0.13	-0.19	-0.26	-0.09	0.34	0.27	0.28	-0.06	1.00						
IQ	0.38	0.06	-0.29	-0.16	-0.01	0.16	0.04	0.21	0.13	0.51	1.00					
INV	0.21	0.17	-0.24	-0.22	-0.22	0.84	0.45	0.07	-0.02	0.44	0.24	1.00				
HC	0.35	0.05	-0.28	-0.39	-0.08	0.28	0.12	0.13	-0.41	0.31	0.12	0.33	1.00			
TRD	0.36	0.20	-0.13	-0.49	-0.37	0.23	0.43	0.12	0.15	0.47	0.06	0.39	0.17	1.00		
POP	-0.49	-0.12	0.24	0.26	0.22	0.14	0.34	0.02	0.06	-0.11	-0.37	0.24	0.13	-0.09	1.00	
INF	-0.04	-0.03	0.29	0.06	0.04	0.10	0.29	-0.34	0.77	-0.02	0.08	0.08	-0.19	0.30	0.10	1.00

Note: GDP=GDP per capita (constant 2010US$); GDPG=Growth rate of GDP (annual %); EDG=External debt as a percentage of GNI; EDX=External debt as a percentage of export; EDI=Interest payment on external debt as a percentage of export.; PRI=Gross fixed capital formation, private sector (proxy for private investment) ; PUI=Gross fixed capital formation, public sector (proxy for public investment); TFP=Total factor productivity; INT=Real interest rate; SAV=Gross saving as a percentage of GDP; IQ=Composite index of institutional quality; INV=Gross fixed capital formation as a percentage of GDP (proxy for investment); HC=Life expectancy at birth (proxy for human capital); TRD=Trade openness as a percentage of GDP; INF=Inflation rate

5.4.3 Panel unit root tests

To verify the unit root feature of each variable in the models, three panel unit root tests were employed: the Levin *et al.* (2002) test, the Im *et al.* (2003) test and the ADF Fisher (suggested by Maddala and Wu (1999)). Table 5.8 reports the test statistic and the probability values for the panel unit root tests for each of the variables. In the Table, the results for the LLC tests are presented in columns 2 and 3, while those of the IPS are in columns 4 and 5. Moreover, the results of the ADF Fisher tests are to be found in columns 6 and 7. Each of the three panel unit root tests operates under the null hypothesis that the series contain unit root, hence, if the probability value of the test statistic is less than the 5% critical value, then the null hypothesis is rejected and it is adjudged that the variable is stationary. If, contrariwise, the value of the test statistic's probability is greater than the 5% critical value, the variable is adjudged non-stationary.

As indicated in the Table, the test statistic and the respective probability values of the variables show that while some variables are stationary at level, several others become stationary, only at first difference. For example, all the three tests are in agreement that variables such as the growth rate of GDP, squared term of interest payment on external debt/export, public investment, saving, institutional quality index, investment, human capital, population growth rate and inflation rate are stationary at levels, while on the other hand, variables like log of GDP per capita, external debt/GNI, external debt/export, total factor productivity and trade openness are all adjudged to be stationary at first difference. All the remaining variables are also adjudged to be either I(0) or I(1) by each of the panel unit root tests. These results indicate that we have a case of mixed stationarity of I(0) and I(1) among our variables; consequently, this makes the panel ARDL approach very suitable for the estimation.

Table 5.8: Panel unit root tests

Variable	LLC test		IPS test		ADF Fisher test	
	Level	First Difference	Level	First Difference	Level	First Difference
LGDP	1.2205 (0.8889)	-6.6248*** (0.0000)	4.0335 (1.0000)	-10.744*** (0.0000)	50.9647 (0.7906)	240.368*** (0.0000)
GDPG	-6.606*** (0.0000)	-21.133*** (0.0000)	-10.589*** (0.0000)	-28.181*** (0.0000)	236.630*** (0.0000)	656.967*** (0.0000)
EDG	-0.1622 (0.4356)	-13.774*** (0.0000)	1.7675 (0.9614)	-14.761*** (0.0000)	41.5849 (0.9664)	327.399*** (0.0000)

Variable	LLC test		IPS test		ADF Fisher test	
	Level	**First Difference**	**Level**	**First Difference**	**Level**	**First Difference**
EDG2	-2.2411** (0.0125)	-16.793*** (0.0000)	-1.1111 (0.1333)	-17.781** (0.0000)	84.5164** (0.0202)	398.235*** (0.0000)
EDX	-0.6694 (0.2516)	-10.962*** (0.0000)	1.0334 (0.8493)	-14.625*** (0.0000)	40.4984 (0.9749)	324.447*** (0.0000)
EDX2	-1.761*** (0.0039)	-12.030*** (0.0000)	-1.0749 (0.1412)	-17.491*** (0.0000)	70.4867 (0.1669)	396.728*** (0.0000)
EDI	-4.3088*** (0.0000)	-12.935*** (0.0000)	-1.2023 (0.1146)	-18.287*** (0.0000)	65.0581 (0.2445)	406.582*** (0.0000)
EDI2	-5.768*** (0.0000)	-16.545*** (0.0000)	-3.844*** (0.0001)	-21.791*** (0.0000)	102.536*** (0.0000)	498.144*** (0.0000)
PUI	-3.141*** (0.0008)	-3.141*** (0.0000)	-2.652*** (0.0040)	-2.652*** (0.0000)	110.575*** (0.0001)	110.575*** (0.0000)
PRI	-1.5716* (0.0580)	-12.912*** (0.0000)	-1.2547 (0.1048)	-14.3576*** (0.0000)	69.0478 (0.1131)	315.947*** (0.0000)
TFP	-0.7515 (0.2262)	-6.9173*** (0.0000)	-0.2842 (0.3881)	-9.1996*** (0.0000)	34.2015 (0.4581)	153.346*** (0.0000)
INT	14.3432 (1.0000)	12.9493*** (0.0000)	-0.0678 (0.4730)	-13.4751*** (0.0000)	79.5682*** (0.0083)	293.431*** (0.0000)
SAV	-1.7669** (0.0386)	-16.1557*** (0.0000)	-3.4298*** (0.0003)	-19.1333*** (0.0000)	102.416*** (0.0003)	444.711*** (0.0000)
IQ	-15.397*** (0.0000)	-15.397*** (0.0000)	-14.254*** (0.0000)	-14.254*** (0.0000)	312.218*** (0.0000)	312.218*** (0.0000)
INV	-2.599*** (0.0047)	-11.258*** (0.0000)	-2.764*** (0.0029)	-15.179*** (0.0000)	96.5374*** (0.0019)	319.522*** (0.0000)
HC	-23.276*** (0.0000)	-7.195*** (0.0000)	-9.192*** (0.0000)	-12.833*** (0.0000)	517.970*** (0.0000)	521.457*** (0.0000)
TRD	1.0580 (0.8550)	-11.353*** (0.0000)	-1.0558 (0.1455)	-15.349*** (0.0000)	70.1883 (0.1731)	324.427*** (0.0000)
POP	-20.675*** (0.0000)	-19.964*** (0.0000)	-27.099*** (0.0000)	-24.322*** (0.0000)	744.155*** (0.0000)	545.954*** (0.0000)
INF	-10.0972*** (0.0000)	-16.903*** (0.0000)	-9.1979*** (0.0000)	-21.062*** (0.0000)	220.108*** (0.0000)	529.748*** (0.0000)

Note: Figures in parenthesis indicate probability values; *, ** and *** represent significance at 10%, 5% and 1%, respectively; LLC=Levin, Li and Chu ; IPS=Im, Pesaran and Shin; ADF=Augmented Dickey-Fuller; GDP=GDP per capita (constant 2010US$); GDPG=Growth rate of GDP (annual %); EDG=External debt as a percentage of GNI; EDG2=Squared term of external debt as a percentage of GNI; EDX=External debt as a percentage of export; EDX2=Squared term of external debt as a percentage of export; EDI=Interest payment on external debt as a percentage of export; EDI2=Squared term of interest payment on external debt as a percentage of export; PRI=Gross fixed capital formation, private sector (proxy for private investment) ; PUI=Gross fixed capital formation, public sector (proxy for public investment); TFP=Total factor productivity; INT=Real interest rate; SAV=Gross saving as a percentage of GDP; IQ=Composite index of institutional quality; INV=Gross fixed capital formation as a percentage of GDP (proxy for investment); HC=Life expectancy at birth (proxy for human capital); TRD=Trade openness as a percentage of GDP; INF=Inflation rate

5.4.4 Estimation and discussion

In order to identify the channels through which the nonlinear effect of external debt is transmitted to economic growth, four potential channels are investigated in this section, as suggested in recent literature (Checherita-Westphal & Rother, 2012:1395; Pattillo *et al.*, 2004:19; Riffat & Munir,

2015:13). The channels comprise investment, which consists of disaggregated private investment and public investment; total factor productivity; saving; and interest rate. A panel ARDL model is estimated to investigate each of these channels with the channel under consideration as the dependent variable, while the main explanatory variables are external debt and its squared term. This is aimed at investigating whether or not the nonlinear impact of external debt on economic growth is transmitted through the channel under consideration. Each of these channels is now discussed in turn.

5.4.4.1 Private investment

Table 5.9 records the results of the panel ARDL estimations for the investigation of private investment as a channel of transmission between external debt and economic growth. A panel ARDL estimation technique affords the estimation of the model by means of pooled mean group (PMG), mean group (MG) and dynamic fixed effect (DFE) estimators, while a Hausman-type test (Hausman, 1978) is employed to ascertain which of the three estimators is consistent and efficient for the model. The test is conducted under the null hypothesis that the difference between PMG and MG or between PMG and DFE is insignificant. If the probability value is greater than the 5% critical value, then the null hypothesis cannot be rejected, in which case, the PMG estimator is advocated as the efficient estimator. If, contrariwise, the probability value is less than the 5% critical value, then the null is rejected in favour of the alternative hypothesis that a significant difference exists between PMG and MG or between PMG and DFE, in which case, the respective MG or DFE is recommended as the efficient estimator.

The results of the test are reported in columns 6 and 7 of Table 5.9. From the results, the null hypothesis, that the difference between PMG and MG is insignificant, cannot be rejected, as the probability value is greater than the 5% critical value. Hence, the PMG is adjudged as the more consistent and efficient estimator over the MG. Furthermore, the null hypothesis that PMG and DFE estimates are not significantly different cannot be rejected, as the probability value is greater than the 5% critical value. This indicates that PMG remains the more efficient estimator, when compared with DFE. As presented in Table 5.9, the PMG results are contained in columns 2 and 3, while the MG results are recorded in columns 4 and 5. Further, columns 8 and 9 contain the DFE estimates. In each of these models, the dependent variable is private investment, while

external debt as a percentage of GNI is the external debt variable. In light of the confirmation of PMG as the most efficient estimator in comparison with MG and DFE, analysis of the investigation of private investment as a channel of transmission between external debt and economic growth will be based mainly on the PMG estimates.

From the long-run PMG results as indicated in columns 2 and 3, the coefficient of the external debt variable is positive, while that of its squared term is negative. Furthermore, both variables are statistically significant at 5% level of significance. These results indicate a concave or inverted U-shaped relationship between external debt and private investment, which suggests that the nonlinear effect of external debt on economic growth is transmitted through private investment. The turning point beyond which external debt begins to affect private investment negatively is estimated as 71% of GNI (0.024605/0.000348 = 70.7).

Above this threshold, the negative effect of external debt on private investment, and subsequently on economic growth can be explained by the fact that as the external debt stock of the economy increases significantly, existing and prospective investors would anticipate the imposition of higher and new taxes by the government. This would decrease the investors' expectations as regards returns on their investment, and in turn, discourage new private investment in the economy. Another argument for the negative effect of external debt on private investment beyond the threshold is that huge debt accumulation could signal higher uncertainty about the economy, and this could constitute discouragement to foreign direct investment. This finding corroborates that of Riffat and Munir (2015:23) who determine that private investment is a channel of transmission from public debt to economic growth. However, it contradicts Checherita-Westphal and Rother (2012:1395) who finds no direct impact of debt on private investment, though the focus of the two studies is public debt.

The coefficient of public investment is negative and statistically significant at the 1% level, indicating that increase in public investment leads to a decline in private investment in the long-run. In this case, public investment could be said to be crowding out private investment. The estimates also show that trade openness is positive and significant at 1% significance level, which indicates that in the long run, opening the economy more fully leads to an increase in investment opportunities, especially foreign investment. This finding is in line with Sinha and Sinha (2002:94)

who suggest that a positive relationship exists among economic growth, openness and investment. Furthermore, the coefficient of interest rate is negative and significant at the 1% level, indicating that in the long run, an increase in the cost of funds discourages private investment in our sample. Lastly, log of GDP per capita is insignificant, which indicates that in the long run, economic growth does not affect private investment. The estimates of DFE as recorded in columns 8 and 9 largely corroborate the PMG estimates, as they also report a nonlinear effect of external debt on private investment, thereby concurring with PMG that private investment is a channel of the nonlinear effect of external debt on growth. The MG results, however, largely deviate from the PMG estimates.

The coefficient of the error correction term (ECT) of the PMG model is negative, less than one, and significant at the 1% level, thereby establishing that all the variables in the model are cointegrated. Moreover, it indicates that previous deviation in the model would converge to equilibrium at the speed of roughly 50%. The ECT for the DFE estimator is equally negative, less than one and insignificant at the 1% level, while that of MG estimator is insignificant. Turning to the short-run estimates, the coefficient of external debt and that of its squared term are significant at the 5% and 1% levels, respectively. Moreover, while the former carries a positive sign, the latter carries a negative one, which suggests that external debt has a nonlinear effect on private investment in the short run as well. The threshold of external debt beyond which it begins to exert negative impact on private investment is computed at 33.8% of GNI (0.501778/0.014824 = 33.8). This result establishes that private investment, in addition to transmitting the nonlinear effect of external debt in the long run, also functions as a channel of transmission between external debt and economic growth in the short run. Public investment is also found to exert negative impact on private investment, just as in the long run, but at 10% significance level. The coefficients of the remaining variables, namely trade openness, interest rate and log of GDP, are insignificant, indicating that none of these variables affect private investment in the short run.

Table 5.9: Private investment model: Panel ARDL results

	Pooled Mean Group		Mean Group		Hausman test		Dynamic Fixed Effect	
Variable	**Coefficient**	**Std. Error**	**Coefficient**	**Std. Error**	**h-test**	**Prob.**	**Coefficient**	**Std. Error**
Long-run coefficients								
ED	0.024605**	0.010633	-1.561741	1.294609			0.007492***	0.002938
$(ED)^2$	-0.000174**	0.000067	0.032776	0.028409			-0.000049**	0.000021
PUI	-0.32016***	0.050418					-0.450325**	0.180356
TRD	0.298871***	0.010590	0.084576	0.125148			0.083727***	0.030263
INT	-0.30239***	0.072465					-0.017367	0.017493
LGDP	-1.156314	1.076745	-9.623955	10.02754			12.25667***	3.122632
MG vs PMG					5.39	0.2493		
DFE vs PMG					7.58	0.4508		
ECT	-0.4990***	0.135616	-0.6431***	0.098349			-0.3681***	0.039414
Short-run coefficients								
ΔED	0.501778**	0.231026	0.138045	0.289388			0.002313	0.008667
$\Delta(ED)^2$	-0.007412*	0.003791	-0.007624	0.008676			8.19E-06	5.74-06
ΔPUI	-0.317716*	0.174652					-0.24088***	0.062993
ΔTRD	0.017820	0.046567	-0.007038	0.046449			0.045907***	0.012956
ΔINT	0.009577	0.184368					0.000882	0.012584
ΔLGDP	-45.2784	29.93446	-10.87632	10.20427			-1.349978	4.217395
Observations	960		960				960	

Note: Dependent variable=Private investment; *, ** and *** represent significance at 10%, 5% and 1%, respectively; ED=External debt as a percentage of GNI; ED2=Squared term of external debt as a percentage of GNI; PUI=Public investment; TRD=Trade openness; INT= Real interest rate; LGDP=Log of GDP; ECT=Error correction term

5.4.4.2 Robustness checks

To test the robustness of the PMG estimates, two alternative panel ARDL models were estimated which were based on the PMG estimator. Each of these estimations was conducted with private investment as the dependent variable and a different measure of external debt as the main explanatory variable in order to test the sensitivity of the results to alternative indicators of external debt burden. The two measures of external debt are external debt as a percentage of export and interest payment on external debt as a percentage of export. Table 5.10 records the results of the robustness tests. While columns 2 and 3 contain the results of the model with external debt/export

as the external debt variable, the model with external debt interest payment/export as the external debt variable is presented in columns 4 and 5 of the Table.

The long-run results of the first model, contained in columns 2 and 3 show that the coefficients of both the external debt variable and that of its squared term are both significant at the 1% level. Moreover, while the former bears a positive sign, the latter bears a negative sign, which indicates a nonlinear effect of external debt on private investment. It also confirms that the relation between the two variables follows an inverted U-shaped pattern, in which case external debt stock at moderate levels enhances private investment, but becomes deleterious to it beyond a particular threshold, which is computed at 293% of export (0.002907/0.00000992 = 293.04). By implication, this model confirms private investment as a channel through which external debt transmits its nonlinear impact to economic growth in the long run, thereby corroborating the results of the main estimation. The coefficient of public investment is negative and significant at the 5% level, indicating a negative effect of public investment on private investment. By this result, this model also confirms the crowding-out impact from public investment to private investment. Furthermore, while the coefficient of log of GDP is positive and significant at the 1% level, indicating a positive impact of economic growth on private investment, that of the interest rate is negative and insignificant, implying that interest rate has no impact on private investment in the long run.

The results also demonstrate that the coefficient of the error correction term is negative, less than one and significant at the 1% level, thereby confirming the long-run relationship among the variables in the model. Furthermore, the said results also indicate that any past disequilibrium would be corrected in the current period at the adjustment speed of 42.4%. The short-run results show that both the external debt variable and its squared term are insignificant, indicating that there is no effect of external debt on private investment in the short run. This result therefore denies the result of the main estimation that private investment is a channel of transmission between external debt and economic growth, also in the short run. In like manner, interest rate and log of GDP also have insignificant coefficients, which indicates that they have no impact on private investment in the short run. Meanwhile, only public investment has a significant coefficient at the 5% level, which is also negative, thereby confirming that it exerts a crowding-out effect on private investment in the short run as well.

Turning to the second model with external debt interest payment/export as the external debt variable whose results are presented in columns 4 and 5 of the Table, the long-run results make it clear that the external debt variable and its squared term are significant at 1% and 5%, respectively. Besides, the former carries a positive sign, while the latter carries a negative one, which is indicative of a nonlinear effect of external debt on private investment. It also indicates the existence of an inverted U-shaped relation between external debt and private investment, with a threshold computed at 20% of export (1.020873/2(0.024996) = 20.42). Below this turning point, external debt stimulates private investment; beyond it, however, external debt becomes deleterious to private investment. By means of this result, private investment is confirmed as a channel through which external debt transmits its nonlinear impact to economic growth in the long run, thereby supporting the results of the main PMG estimation. Further, the coefficients of both public investment and log of GDP are significant at the 1% level. While the former carries a negative sign, which confirms a crowding-out effect of public investment on private investment, the latter is positive, indicating that economic growth affects private investment directly in the long run. The coefficients of trade openness and interest rate turn out to be insignificant, indicating that neither of the two variables affects private investment in the long run.

The error correction term turns out to be negative, less than one, and significant at the 1% level, which indicates the existence of a long-run association among the variables in the model. Furthermore, it confirms that previous divergence from equilibrium would be corrected in the current period at the adjustment speed of 31.1%. The short-run results show that both external debt variables are insignificant, indicating no effect of external debt on private investment in the short run, thereby contradicting the results of the main estimation that private investment is a channel of transmission in the external debt-growth nexus, in the short run too. Likewise, public investment, interest rate and log of GDP all yield negative and insignificant coefficients, indicating that none of these variables affect private investment in the short run. Meanwhile, trade openness turns out to be positive and significant at the 5% level, affirming that it affects private investment directly in the short run.

Table 5.10: Private investment model: Robustness test

Variable	ED = External Debt/Export		ED = Interest payment/Export	
	Coefficient	Std. Error	Coefficient	Std. Error
Long-run coefficients				
ED	0.002907***	0.001016	1.020873***	0.229479
$(ED)^2$	-4.96E-06***	1.82E-06	-0.024996**	0.010011
PUI	-0.150674**	0.066150	-0.323987***	0.094209
TRD			-0.015598	0.011354
INT	-0.107728	0.065771	-0.094972	0.069319
LGDP	11.303***	2.134101	5.826876***	1.631463
ECT	-0.4235***	0.062349	-0.3109***	0.102233
Short-run coefficients				
ΔED	-0.066364	0.045157	0.090809	1.068515
$\Delta(ED)^2$	0.000029	0.000394	-0.028811	0.222725
ΔPUI	-0.290188**	0.146782	-0.223897	0.210419
ΔTRD			0.098305**	0.040601
ΔINT	0.336594	0.394108	-0.078538	0.120739
ΔLGDP	3.482384	7.718739	-7.15009	11.15752
Observations	960		863	

Note: Dependent variable=Private investment; *, ** and *** represent significance at 10%, 5% and 1%, respectively; ED=External debt variable; ED2=Squared term of external debt variable; PUI=Public investment; TRD=Trade openness; INT= Real interest rate; LGDP=Log of GDP; ECT=Error correction term

5.4.4.3 Public investment

Table 5.11 provides the results of the panel ARDL estimations for the investigation of public investment as a channel of transmission between external debt and economic growth. A panel ARDL estimation technique affords the estimation of the model by means of pooled mean group (PMG), mean group (MG) and dynamic fixed effect (DFE) estimators, while a Hausman-type test (Hausman, 1978) is employed to ascertain which of the three estimators is consistent and efficient for the model. The results of the test are presented in columns 6 and 7 of Table 5.11. From the results, the null hypothesis that the difference between PMG and MG is insignificant cannot be rejected, as the probability value is greater than the 5% critical value. Hence, the PMG is adjudged as the more consistent and efficient estimator over the MG. Furthermore, the null hypothesis that

PMG and DFE estimates are not significantly different cannot be rejected, as the probability value is greater than the 5% critical value. This indicates that PMG remains the more efficient estimator, when compared with DFE.

As presented in the Table, the PMG results are contained in columns 2 and 3, while the MG results are reported in columns 4 and 5. Further, columns 8 and 9 contain the DFE estimates. In each of these models, the dependent variable is public investment, while external debt as a percentage of GNI is the external debt variable. In light of the confirmation of PMG as the most efficient estimator in comparison with MG and DFE, analysis of the investigation of public investment as a channel of transmission between external debt and economic growth will mainly be based on the PMG estimates.

The PMG long-run estimates in columns 2 and 3 of the Table make it evident that both the external debt variable and its squared term are significant at the 1% level. While the former bears a positive sign, the latter bears a negative sign, thereby indicating a case of nonlinear impact of external debt on public investment. Moreover, the respective signs of the external debt variables also identify an inverted U-shaped relationship between external debt and public investment, which implies that external debt at moderate levels enhances public investment, before reaching a threshold beyond which the effect turns negative. This result, therefore, suggests that the nonlinear effect of external debt on economic growth is transmitted through public investment. The external debt turning point is estimated at 31.5% of GNI (0.016371/2(0.00026) = 31.48). Above this threshold, the negative effect of external debt on public investment, and subsequently on economic growth, can be explained by the fact that huge debt accumulation is accompanied by a high debt servicing burden, which might lead to a reduction in capital expenditure for the economy, thereby exerting a negative impact on the infrastructural development which is much needed to stimulate economic growth.

This finding corroborates Checherita-Westphall and Rother (2012:1395) and Riffat and Munir (2015:23) who find public investment to be a channel of transmission from debt to economic growth, though as noted, the focus in both studies is public debt. Meanwhile, neither the MG nor the DFE estimates supports the nonlinear effect of external debt on public investment in the long run, with DFE in columns 8 and 9 reporting a negative effect of external debt on public investment, going by the negative and significance of the external debt variable at the 10% level. The MG

estimates, on the other hand, report no effect of external debt on public investment, given the insignificance of the external debt variables. The coefficient of private investment from the PMG estimates is negative and significant at the 1% level, indicating a negative effect of private investment on public investment, in which case an increase in private investment is associated with a reduction in public investment, and vice-versa. The coefficients of interest rate and population growth rate are both insignificant, indicating that both variables have no impact on public investment in the long run.

The coefficient of the error correction term (ECT) is negative, less than and significant at the 1% level, which confirms the existence of a long-run relationship among the variables in the model. Furthermore, this result suggests that though there could be a deviation from equilibrium in the short run, such deviation is corrected in the long run at an adjustment speed of 46.9%. The ECT for the MG and DFE estimators are equally negative, less than one and insignificant at the 1% level. The results of the short-run coefficients demonstrate that both external debt variables are insignificant, which suggests that external debt does not affect public debt in the short run. Moreover, the coefficients of all the control variables are equally insignificant, thereby pointing to a lack of relationship between external debt and all the variables in the short-run.

Table 5.11: Public investment model: Panel ARDL results

Variable	Pooled Mean Group		Mean Group		Hausman test		Dynamic Fixed Effect	
	Coefficient	Std. Error	Coefficient	Std. Error	h-test	prob.	Coefficient	Std. Error
Long-run coefficients								
ED	0.016371***	0.005968	-2.097509	1.640724			-0.012432*	0.007215
$(ED)^2$	-0.00026***	8.71E-05	0.020581	0.014988			8.00E-06	6.37E-06
PRI	-0.11683***	0.030777	1.130042	1.176370			-0.099018*	0.056253
INT	-0.005618	0.003963	0.015002	0.011123			-0.018444*	0.009904
POP	-0.158855	0.267331					0.325207	0.491149
MG vs PMG					5.05	0.1683		
DFE vs PMG					1.80	0.2498		
ECT	-0.4688***	0.067907	-0.5321***	0.063446			-0.5295***	0.043811

Variable	Pooled Mean Group		Mean Group		Hausman test		Dynamic Fixed Effect	
	Coefficient	Std. Error	Coefficient	Std. Error	h-test	prob.	Coefficient	Std. Error
Short-run coefficients								
ΔED	-0.065102	0.119646	0.285593	0.300788			0.008601	0.006612
$\Delta(ED)^2$	0.000830	0.002350	-0.005637	0.006119			-5.66E-06	4.02E-06
ΔPRI	-0.155360	0.101287	-0.052042	0.083261			-0.1685***	0.038401
ΔINT	0.343405	0.348081	0.001127	0.012151			0.016217	0.010192
ΔPOP	-5.894901	8.791115					-0.629194	0.784482
Observations	960		960				960	

Note: Dependent variable=Public investment; * and *** represent significance at 10% and 1%, respectively; ED=External debt variable; ED2=Squared term of external debt variable; PRI=Private investment; INT= Real interest rate; POP=Population growth rate; ECT=Error correction term

5.4.4.4 Robustness checks

In order to assess the robustness of the PMG estimates, two additional panel ARDL models were estimated based on the PMG estimator. In each of the models, public investment, denoted by GFCF for public sector, remains the dependent variable. Furthermore, each of the models was estimated with an alternative proxy of external debt so as to test the sensitivity of the main results to alternative external debt measures. The results of the robustness checks are reported in Table 5.12. In the Table, results for the model with external debt as a percentage of export as the external debt variable is contained in columns 2 and 3, while the model with interest payment on external debt as a percentage of export as the external debt variable is displayed in columns 4 and 5.

In the model with external debt as a percentage of export as the external debt variable in columns 2 and 3, both the external debt variable and its squared term are significant at the 1% level. Further, while the former carries a positive sign, the latter bears a negative one. These results suggest that external debt exerts a nonlinear impact on public debt, which is eventually transmitted to economic growth. By means of this result, the main estimation's finding that public investment is a channel of transmission from external debt to economic growth is corroborated. These results also signify that external debt at moderate levels enhances public investment, but depresses it when a certain threshold of external debt stock is surpassed. This threshold is computed at 71% of export (0.009459/2(0.0000666) = 71). Furthermore, the coefficient of interest rate is negative and significant at the 1% level, indicating that higher interest rates are associated with lower public

investment in the long run, and vice-versa. Lastly, private investment turns out to be negative and insignificant, signifying that it does not affect public investment in the long run.

The ECT is negative, less than one and significant at the 1% level. This result establishes the existence of a long-run relationship among the variables. It also indicates that any previous disequilibrium in the previous period will be corrected at the adjustment speed of 41%. The short-run results confirm that the coefficients of the two external debt variables are both insignificant, which suggests that external debt has no impact on public investment in the short run. Interest rate also follows suit with an insignificant coefficient, implying that interest rate does not affect public investment in the short run. However, the coefficient of private investment is negative and significant at the 5% level. This makes it clear that private investment affects public investment negatively in the short run.

Turning to the results of the model with interest payment on external debt as a percentage of export, which is recorded in columns 4 and 5, the long-run results indicate that the coefficients of both the external debt variable and its squared term are statistically significant at the 1% level. Furthermore, the former bears a positive sign, while the latter is negative, indicating a nonlinear impact of external debt on public investment, and eventually on economic growth. These results, therefore, support the finding of the main regression that public investment is a channel of transmission from external debt to economic growth. These results also reveal that the relationship between external debt and public investment is concave or hump-shaped, which signals the existence of a turning point of external debt interest payment beyond which it becomes deleterious to public investment and, eventually, to economic growth. This threshold is computed at 12.1% of export (0.439583/2(0.018199) = 12.08).

The ECT is negative, less than one and significant at the 1% level. This establishes the existence of a long-run relationship among the variables in the model. In addition, it indicates that any previous error would be corrected at the adjustment speed of 41.4%. The short-run results affirm that the external debt variables and its squared term are insignificant, which indicates that external debt does not affect public investment in the short run. In like manner, interest rate turns out insignificant, indicating no effect on public investment in the short run. Meanwhile, private

investment turns out negative and significant, which implies that in the short run, higher levels of private investment are associated with lower public investment.

In conclusion, results from both models estimated to assess the sensitivity of the main estimates to alternative external debt measures support the main results, especially as regards the claim that public investment serves as a channel for transmitting nonlinear impact from external debt to economic growth in the long run. The results also confirm the main estimation's claim that external debt does not affect public investment in the short run. Results of other variables' coefficients in the robustness test also largely corroborate the main results. Overall, the main PMG estimates are found to be robust to alternative measures of external debt.

Table 5.12: Public investment model: Robustness test

	ED = External Debt/Export		**ED = Interest payment/Export**	
Variable	**Coefficient**	**Std. Error**	**Coefficient**	**Std. Error**
Long-run coefficients				
ED	0.009459***	0.001291	0.439583***	0.087737
$(ED)^2$	-6.66E-05***	1.60E-05	-0.018199***	0.004786
PRI	-0.004965	0.0020981	-0.089988***	0.023034
INT	-0.025851***	0.007905	-0.051599***	0.010555
ECT	-0.4132***	0.111138	-0.4138***	0.083161
Short-run coefficients				
ΔED	-0.012868	0.047315	-0.208898	0.388876
$\Delta(ED)^2$	-0.000323	0.000598	0.009253	0.114339
ΔPRI	-0.224214**	0.091557	-0.206871**	0.104286
ΔINT	0.519764	0.408156	0.053286	0.050762
Observations	960		863	

Note: Dependent variable=Public investment; ** and *** represent significance at 5% and 1%, respectively; ED=External debt variable; ED2=Squared term of external debt variable; PRI=Private investment; INT= Real interest rate; ECT=Error correction term

5.4.4.5 Total factor productivity

Table 5.13 reports the results of panel ARDL estimations for the investigation of total factor productivity (TFP) as a channel of transmission between external debt and economic growth. As a panel ARDL estimation technique affords the estimation of the model by means of pooled mean group (PMG), mean group (MG) and dynamic fixed effect (DFE) estimators, a Hausman-type test (Hausman, 1978) is employed to ascertain which of the three estimators is consistent and efficient for the model. The results of the test are to be found in columns 6 and 7 of Table 5.13. From the results, the null hypothesis that the difference between PMG and MG is insignificant cannot be rejected, as the probability value is greater than the 5% critical value. Hence, the PMG is adjudged the more consistent and efficient estimator over the MG. Furthermore, the null hypothesis that PMG and DFE estimates are not significantly different cannot be rejected, as the probability value is greater than the 5% critical value. This indicates that PMG remains the more efficient estimator, also when compared with DFE.

In the Table, the PMG results are contained in columns 2 and 3, while the MG results are reported in columns 4 and 5. Further, columns 8 and 9 contain the DFE estimates. In each of these models, the dependent variable is TFP, while external debt as a percentage of GNI is the external debt variable. In light of the Hausman test's confirmation of PMG as the most efficient estimator in comparison with MG and DFE, analysis of the investigation of TFP as a channel of transmission between external debt and economic growth will be based mainly on the PMG estimates.

The PMG long-run estimates in columns 2 and 3 of the Table make it evident that both the external debt variable and its squared term are significant at 10% and 5% levels, respectively. While the former bears a positive sign, the latter bears a negative sign, thereby indicating a case of nonlinear impact of external debt on TFP. Moreover, the respective signs of the external debt variables also bespeak an inverted U-shaped relationship between external debt and TFP, which implies that external debt at moderate levels enhances TFP, before reaching a threshold beyond which the effect becomes negative. This result, consequently, suggests that the nonlinear effect of external debt on economic growth is transmitted through TFP.

The external debt threshold is computed at 85% of GNI (0.001512/2(0.00000885) = 85.42). Above this threshold, the negative effect of external debt on TFP, and subsequently on economic growth

could emanate from possible government reluctance to initiate and implement costly economic reforms and policies, in the face of enormous external debt stock, especially when it is believed that most gains from such reforms and policies would accrue to the external debt creditors, rather than to the citizens. In the absence of such reforms and policies, productivity might decline, which in turn could make economic growth slow down. From another perspective, debt overhang, arising from huge external debt accumulation often culminates in growing economic uncertainties, which could disincentivise investment in technology (Pattillo *et al.*, 2004:3). This could in turn affect total factor productivity, and subsequently, economic growth, negatively.

This result is in line with some previous findings (Checherita-Westphall & Rother, 2012:1395; Pattillo *et al.*, 2004:19; Riffat & Munir, 2015:25). In their studies on the public debt-economic growth nexus in both developing and industrial countries, these authors all conclude that TFP is a channel through which nonlinear effect is transmitted from public debt to economic growth. On the other hand, these results contradict that of Schclarek (2004:11) who finds no robust evidence that TFP is a channel of transmission from external debt to economic growth in developing countries. Furthermore, the MG and DFE estimates in columns 4 and 5, and columns 8 and 9, respectively, do not corroborate the PMG estimates, as both estimates convey no relationship between external debt and TFP, going by the insignificance of the two debt variables in each of the models.

The coefficient of institutional quality index is positive and significant at the level of 1%, indicating that more improved institutions in SSA leads to higher TFP in the long run. Specifically, holding other factors constant, a one-unit improvement in quality of institutions would lead to a 0.02-unit increase in TFP, and vice-versa. The coefficient of human capital is equally positive and significant at the 5% level, which signifies that human capital affects TFP positively in the long run. Precisely, holding other factors constant, a unit improvement in human capital would enhance TFP by 0.009 units, and vice-versa. However, investment is found to exert a negative effect on TFP in the long run, given the negative and statistical significance of its coefficient at the 1% level. These results are largely corroborated by the DFE estimates, but are unsupported by the MG, as none of the variables in the model is significant.

The coefficient of the ECT is negative, less than one and significant at 1%. This confirms the existence of a long-run relationship among the variables in the model. Furthermore, it conveys the correction of any previous disequilibrium in the system at the adjustment speed of 10.4%. The ECT for the MG and DFE estimators are equally negative, less than one and insignificant at the 1% level. For the short-run results, the estimates deny any effect of external debt on TFP, as the coefficients of both the external debt variable and its squared term are insignificant. This also applies to institutional quality index and investment, as both variables turn out insignificant. However, the coefficient of human capital is positive and significant at the 5% level, indicating that improved human capital enhances TFP, and vice-versa, in the short run. DFE estimates do not support the PMG results as they indicate that TFP is a channel of nonlinear impact from external debt to economic growth in the short run, given the significance and the alternate signs of the two external debt variables in the model.

Table 5.13: TFP model: Panel ARDL

	Pooled Mean Group		**Mean Group**		**Hausman test**		**Dynamic Fixed Effect**	
Variable	**Coefficient**	**Std. Error**	**Coefficient**	**Std. Error**	**h-test**	**Prob.**	**Coefficient**	**Std. Error**
Long-run coefficients								
ED	0.001512*	0.000804	-0.007820	0.004867			-0.000131	0.001117
$(ED)^2$	-8.85E-06**	2.87E-06	0.000027	0.000033			-4.42E-06	3.20E-06
IQ	0.02259***	0.002167					0.037506	0.38822
INV	-0.01545***	0.002599					-0.013817**	0.004103
HC	0.009259**	0.004194					0.019308***	0.006934
TRD			0.008123	0.004947				
POP			0.139348	0.142747				
MG vs PMG					3.29	0.1932		
DFE vs PMG					0.04	0.9998		
ECT	-0.1039***	0.033689	-0.2842***	0.055877			-0.1045***	0.017403

	Pooled Mean Group		Mean Group		Hausman test		Dynamic Fixed Effect	
Variable	**Coefficient**	**Std. Error**	**Coefficient**	**Std. Error**	**h-test**	**Prob.**	**Coefficient**	**Std. Error**
Short-run coefficients								
ΔED	-0.000537	0.000668	-0.000145	0.000462			0.000549***	0.017403
$\Delta(ED)^2$	-3.06E-06	4.84E-06	-1.00E-06	4.97E-06			-8.04E-07**	3.32E-07
ΔINS	0.005056	0.008705					0.007449	0.007901
ΔINV	0.000599	0.000436					-0.000072	0.000671
ΔHC	0.020029**	0.007773					0.000313	0.004349
ΔTRD			-0.00073*	0.000367				
ΔPOP			0.007059	0.064841				
Observations	960		960				960	

Note: Dependent variable=Total factor productivity; *, ** and *** represent significance at 10%, 5% and 1%, respectively; ED=External debt as a percentage of GNI; ED2=Squared term of external debt as a percentage of GNI; IQ=Composite index of institutional quality; INV=Investment; HC= Human capital; TRD=Trade openness as a percentage of GDP; POP=Population growth rate; ECT=Error correction term

5.4.4.6 Robustness checks

To assess the robustness of the PMG estimates, two additional panel ARDL models were estimated based on the PMG estimator. In each of the models, total factor productivity (TFP) remains the dependent variable. Furthermore, each of them was estimated with an alternative proxy of external debt to test the sensitivity of the main results to alternative external debt measures. The results of the robustness checks are reported in Table 5.14. In the Table, results for the model with external debt as a percentage of export as the external debt variable are contained in columns 2 and 3, while the results of the model with interest payment on external debt as a percentage of export as the external debt variable are displayed in columns 4 and 5.

In the model with external debt as a percentage of export as the external debt variable in columns 2 and 3, the long-run results make it evident that the external debt variable is negative and significant at the 1% level, while its squared term is also negative, but insignificant. These results deny that external debt exerts a nonlinear impact on TFP, and subsequently on economic growth. Rather, they indicate that external debt has a negative effect on TFP. In other words, these results confirm TFP as a channel that transmits a linear and negative, rather than a nonlinear effect from external debt to economic growth. In terms of this result, the main estimation's finding that TFP

is a channel of transmitting nonlinear effect from external debt to economic growth is not corroborated. Furthermore, the coefficient of institutional quality index is positive and significant at the 1% level, indicating that better institutions are associated with higher TFP in the long run, and vice-versa. Also, the growth rate of GDP is found to be positive and insignificant, signifying that TFP is not affected by the variable in the long run. Lastly, human capital has a negative and significant coefficient at 1%, indicating a negative effect of human capital on TFP.

The ECT is negative, less than one and significant at the 10% level. This result establishes the existence of a long-run relationship among the variables. It also indicates that any previous disequilibrium in the previous period will be corrected at the adjustment speed of 11.5%. For the short-run estimates, the external debt variables are positive and significant at 5%, while their squared term is negative and insignificant. These results refute the existence of nonlinearity in the relationship between external debt and TFP in the short run. Rather, they suggest the relationship is linear and positive. By implication, TFP is found to be a channel for transmitting a linear and positive, rather than nonlinear effect from external debt to economic growth in the short run. Furthermore, the institutional quality index is established to be positive and significant at 5%, which demonstrates that better institutions enhance TFP in the short run, and vice-versa. Finally, the coefficients of growth rate of GDP and human capital are positive and insignificant, which implies that neither of the variables influence TFP in the short run.

Turning to the PMG estimates of the model with interest payment on external debt as a percentage of export as the external debt variable, displayed in columns 4 and 5, the long-run results show that the external debt variable is negative and significant at the 1% level, while its squared term is positive, but insignificant. These results deny that external debt exerts a nonlinear impact on TFP, and subsequently on economic growth. Rather, they indicate that external debt has a negative effect on TFP. In other words, these results confirm TFP as a channel that transmits linear and negative, rather than a nonlinear effect from external debt to economic growth. In terms of this result, the main estimation's finding that TFP is a channel of transmitting nonlinear effect from external debt to economic growth is not corroborated. However, it supports the results of the first PMG robust test with external debt/export as the external debt variable. Furthermore, the coefficient of institutional quality index is positive and significant at the 1% level, indicating that better institutions are associated with higher TFP in the long run, and vice-versa. Also, the growth rate

of GDP is found to be positive and significant at the 1% level, indicating that TFP is positively influenced by the variable in the long run. Lastly, human capital turns out to be negative and significant at 1%, indicating a negative effect on TFP in the long run.

The ECT is negative, less than one and significant at the 1% level. This result establishes the existence of a long-run relationship among the variables. It also indicates that any previous disequilibrium in the previous period will be corrected at the adjustment speed of 12.6%. For the short-run estimates, the two external debt variables are insignificant. These results reject the existence of a relationship between external debt and TFP in the short run. By implication, TFP is not found to be a channel of transmission from external debt to economic growth in the short run. Furthermore, institutional quality index and GDP growth rate are established to be insignificant, which suggests that both variables do not affect TFP in the short run. Finally, the coefficient of human capital is positive and significant at 10%, which implies that it has a positive effect on TFP in the short run.

In conclusion, the results of the robustness tests conducted suggest that the finding in the main PMG estimation, that TFP is a channel through which nonlinear effect is transmitted to economic growth is not robust, as both robustness test estimates report a negative and linear effect of external debt on TFP, and eventually on economic growth. We can therefore conclude that though TFP is confirmed as a channel of transmission from external debt to economic growth in the long run, only weak evidence exists that the effect is nonlinear. The results of other variables in the robustness tests largely resemble those of the main estimation.

Table 5.14: TFP model: Robustness test

Variable	ED = External Debt/Export		ED = Interest payment/Export	
	Coefficient	Std. Error	Coefficient	Std. Error
Long-run coefficients				
ED	-0.0003***	0.000084	-0.023633***	0.006307
$(ED)^2$	-5.20E-08	5.28E-08	0.000328	0.000354
IQ	0.010148***	0.001708	0.036012***	0.011679
GDPG	0.002709	0.024992	0.011091***	0.002081
HC	-0.009779***	0.002079	-0.004145***	0.001577
ECT	-0.1153*	0.069224	-0.1257***	0.037982

Variable	ED = External Debt/Export		ED = Interest payment/Export	
	Coefficient	Std. Error	Coefficient	Std. Error
Short-run coefficients				
ΔED	0.000261**	0.000122	0.001301	0.004269
$\Delta(ED)^2$	-8.29E-06	7.47E-06	-0.000169	0.000456
ΔIQ	0.013342**	0.006046	0.007624	0.009431
GDPG	0.092653	0.088278	-0.000058	0.000573
ΔHC	0.011131	0.011134	0.017696*	0.009944
Observations	960		863	

Note: Dependent variable=Total factor productivity; *, ** and *** represent significance at 10%, 5% and 1%, respectively; ED=External debt variable; ED2=Squared term of external debt variable; IQ=Composite index of institutional quality; GDPG=Growth rate of GDP; HC=Human capital; ECT=Error correction term

5.4.4.7 Interest rate

Table 5.15 records the results of panel ARDL estimations for the investigation of interest rate as a channel of transmission from external debt to economic growth. As panel ARDL estimation technique affords the estimation of the model by means of pooled mean group (PMG), mean group (MG) and dynamic fixed effect (DFE) estimators, a Hausman-type test (Hausman, 1978) is consequently employed to ascertain which of the three estimators is consistent and efficient for the model. The results of the test are presented in columns 6 and 7 of Table 5.15. From the results, the null hypothesis that the difference between PMG and MG is insignificant cannot be rejected, since the probability value is greater than the 5% critical value. Hence, the PMG is adjudged the more consistent and efficient estimator over the MG. Furthermore, the null hypothesis that PMG and DFE estimates are not significantly different cannot be rejected, as the probability value is greater than the 5% critical value. This indicates that PMG remains the more efficient estimator, also when compared with DFE.

As presented in the Table, the PMG results are to be found in columns 2 and 3, while the MG results are contained in columns 4 and 5. Further, columns 8 and 9 record the DFE estimates. In each of these models, the dependent variable is the real interest rate, while external debt as a percentage of GNI is the external debt variable. In light of the Hausman test's confirmation of PMG as the most efficient estimator in comparison with MG and DFE, analysis of the investigation of interest rate as a channel of transmission between external debt and economic growth would be based mainly on the PMG estimates.

In columns 2 and 3 of the Table, the long-run results of the PMG estimates signify that the external debt variable is positive and significant at the 1% level, which demonstrates that external debt exerts a positive impact on interest rate. In other words, increase in external debt leads to a rise in interest rate, and vice-versa, in the long run. Specifically, a unit rise in external debt stock is associated with a 0.15-unit increase in interest rate, and vice-versa. The results also make it clear that the squared term of the external debt variable is negative and insignificant, which indicates that the effect of external debt on interest rate is not nonlinear, but linear. This is because nonlinearity in the relationship between the two variables requires not only that the two variables bear opposite signs, but also that the two variables be statistically significant.

In terms of this result, interest rate is adjudged a channel for transmitting a linear effect from external debt to economic growth. This implies that regardless of the level of external debt, its effect on interest rate is direct, and this is expected to transmit a negative impact to economic growth subsequently. This result does not support findings in existing studies by Checherita-Westphal and Rother (2012:1395) and Riffat and Munir (2015:26) for the South Asia and Euro areas, respectively. Results from both studies confirm that the coefficients of both the public debt variable and its squared term are insignificant in affecting the nominal long-term interest rate, which indicates that interest rate is not a channel of transmission from public debt to economic growth. However, when short-term interest rate is employed as the dependent variable by Checherita-Westphal and Rother (2012:1398), public debt ratio is found to be highly significant, which is in line with this study's finding.

The coefficient of trade openness is positive and significant at the 1% level, which proves that in the long run, the more open the economies become to trade with other economies, the higher the rate of interest becomes. Specifically, a unit increase in trade openness leads to a 0.006 unit increase in interest rate, and vice-versa. The results also point to the growth rate of GDP as exerting a negative impact on interest rate, going by the coefficient of GDP growth rate being negative and significant at 1%. This result demonstrates that increase in GDP growth leads to a reduction in interest rate in the long run. Furthermore, the coefficient of inflation rate is positive and significant at the 1% level, signalling a positive effect of inflation on interest rate in the long run. By implication, as inflation rate increases, interest rate also rises, and vice-versa. The results of the

MG and DFE estimators do not corroborate that of the PMG, as virtually all the variables in the two models are insignificant.

Another very important result is that of the ECT, which is proven to have a significant coefficient at the 1% level. It is also negative and less than one, which indicates that there indeed exists a long-run association among the variables in the model. Moreover, it affirms that any previous disequilibrium in the system will eventually converge at equilibrium at the adjustment speed of 50.1%. The ECT for the MG and DFE estimators are equally negative, less than one and insignificant at the 1% level. The PMG short-run results show that both external debt and its squared term are insignificant, which indicates that external debt does not influence interest rate in the short run. Similarly, trade openness has a positive and insignificant coefficient, which makes it evident that openness of the economies to trade has no impact on interest rate in the short run. The coefficient of GDP growth is positive and significant at the 10%, which demonstrates that economic growth leads to an increase in interest rate in the short run, as opposed to its reducing effect in the long run. Lastly, inflation is shown to have a negative effect on interest rate in the short run, going by its negative and significant coefficient at the 1% level. While the results of both MG and DFE short-run models largely support that of PMG, the main exceptions include the positive and significance of the external debt variable at the 5% level as reported by DFE, and the insignificance of all the variables of the MG model.

Table 5.15: Interest rate model: Panel ARDL results

Variable	Pooled Mean Group		Mean Group		Hausman test		Dynamic Fixed Effect	
	Coefficient	Std. Error	Coefficient	Std. Error	h-test	prob.	Coefficient	Std. Error
Long-run coefficients								
ED	0.001519***	0.000554	-0.502216	1.838609			0.063476	0.051812
$(ED)^2$	-9.40E-07	2.23E-06	0.007243	0.019402			-0.000024	0.000052
TRD	0.006220***	0.001121	0.885321	1.052986			-0.092206	0.125211
GDPG	-0.21818***	0.042818					5.136870	3.298553
INF	0.855379***	0.245503	0.596819	1.572292			-7.48810**	3.511950
MG vs PMG					1.29	0.7321		

Variable	Pooled Mean Group		Mean Group		Hausman test		Dynamic Fixed Effect	
	Coefficient	Std. Error	Coefficient	Std. Error	h-test	prob.	Coefficient	Std. Error
DFE vs PMG					3.35	0.1143		
ECT	-0.5009***	0.079633	-0.6327***	0.072474			-0.4943***	0.030614
Short-run coefficients								
ΔED	-0.883934	0.789779	-0.125751	0.092456			0.118998**	0.049224
$\Delta(ED)^2$	0.007518	0.006115	0.000777	0.000632			-0.000049	0.000035
ΔTRD	0.073471	0.100274	0.111098	0.159172			0.046701	0.081154
ΔGDG	7.846357*	4.495212					1.854742	3.417032
ΔINF	-0.43747***	0.067132	0.030672	0.115217			3.701162**	1.741917
Observations	960		960				960	

Note: Dependent variable=Interest rate; *, ** and *** represent significance at 10%, 5% and 1%, respectively; ED=External debt as a percentage of GNI; ED2=Squared term of external debt as a percentage of GNI; TRD=Trade openness as a percentage of GDP; GDPG=GDP growth rate; INF=Inflation rate; ECT=Error correction term

5.4.4.8 Robustness checks

To assess the robustness of the PMG estimates, two additional panel ARDL models were estimated based on the PMG estimator. In each of the models, the real interest rate remains the dependent variable. Furthermore, each of the models was estimated with an alternative proxy of external debt to test the sensitivity of the main PMG estimates to different external debt measures. The results of the robustness checks are reported in Table 5.16. In the Table, results for the model with external debt as a percentage of export as the external debt variable are recorded in columns 2 and 3, while the results for the model with interest payment on external debt as a percentage of export as the external debt variable are displayed in columns 4 and 5.

In columns 2 and 3, the long-run results of the model with external debt/export as external debt variable afford evidence that the coefficient of the external debt variable is positive and significant at the 1% level, which proves that external debt exerts a positive impact on interest rate. In other words, increase in external debt leads to a rise in interest rate, and vice-versa, in the long run. Specifically, a unit rise in external debt stock is associated with a 0.0005 unit increase in interest rate, and vice-versa. The results also point to the fact that the squared term of the external debt

variable is positive and insignificant, which indicates that the effect of external debt on interest rate is not nonlinear, but linear. This is because nonlinearity in the relationship between the two variables requires not only that the two variables bear opposite signs, but also that the two variables be statistically significant. By means of this result, interest rate is adjudged a channel of transmitting a linear effect from external debt to economic growth. This implies that regardless of the level of external debt, its effect on interest rate is direct, and this is expected to transmit a negative impact to economic growth subsequently. The result of this robustness test, therefore, lends support to that of the main estimation.

For the long-run results of the control variables in the model, the coefficient of trade openness is positive and significant at the 5% level, which implies that in the long run, the more open the economies become to trade with other economies, the higher the rate of interest becomes. Specifically, a unit increase in trade openness leads to a 0.003-unit increase in interest rate, and vice-versa. The results also point to the growth rate of GDP as exerting a negative impact on interest rate, going by the coefficient of GDP growth rate being negative and significant at 1%. This result shows that increase in GDP growth leads to a reduction in interest rate in the long run. Furthermore, the coefficient of inflation rate is positive and significant at the 1% level, signalling a positive effect of inflation on interest rate in the long run. By implication, as the inflation rate increases, the interest rate also rises, and vice-versa.

Another very important result is that of the ECT, which is demonstrated to have a significant coefficient at the 1% level. It is also negative and less than one, which indicates that indeed there exists a long-run relation among the variables in the model. Moreover, it proves that any previous disequilibrium in the system will eventually converge at equilibrium at the adjustment speed of 46.4%. The PMG short-run results show that both external debt and its squared term are insignificant, which indicates that external debt does not influence interest rate in the short run. Similarly, trade openness has a positive and insignificant coefficient, which indicates that openness of the economies to trade has no impact on interest rate in the short run. The coefficient of GDP growth is also positive and insignificant; this makes it obvious that economic growth does not influence interest rate in the short run. Lastly, inflation is demonstrated to have a negative effect on interest rate in the short run, going by its negative and significant coefficient at the 1% level. Overall, the results of this robustness test are very similar to those of the main estimation.

Turning to the second robustness test, which is the model with external debt interest payment/export as the external debt variable, it is presented in columns 4 and 5 of Table 5.16. The long-run estimates of the model indicate that the coefficient of the external debt variable is positive and significant at the 5% level, which confirms that external debt exerts a positive impact on interest rate. In other words, increase in external debt leads to a rise in interest rate, and vice-versa, in the long run. The results also prove that the squared term of the external debt variable is equally positive and significant but at 1% significance level, which indicates that the effect of external debt on interest rate is not nonlinear, but linear. This is because nonlinearity in the relationship between the two variables requires not only that the two variables have significant coefficients, but also that the two variables carry opposite signs. In terms of this result, interest rate is adjudged a channel of transmitting a linear effect from external debt to economic growth. This implies that regardless of the level of external debt, its effect on interest rate is direct, and this is expected to transmit a negative impact to economic growth subsequently. In essence, these results lend support to those of the main PMG estimates: that interest rate serves as a channel for transmitting linear effect from external debt to economic growth.

The coefficient of trade openness is positive and significant at the 1% level, which affirms that in the long run, the more open the economies become to trade with other economies, the higher the rate of interest becomes. Specifically, a unit increase in trade openness leads to a 0.01 unit increase in interest rate, and vice-versa. The results also confirms the coefficient of GDP growth rate is negative and statistically insignificant, which indicates that the variable does not affect interest rate in the long run. Furthermore, the coefficient of inflation rate is positive and significant at the 1% level, signalling a positive effect of inflation on the interest rate in the long run. By implication, as inflation rate increases, the interest rate also rises, and vice-versa.

Moreover, the ECT is indicated to have a significant coefficient at the 1% level. It is also negative and less than one, which indicates that there is indeed a long-run relation among the variables in the model. Moreover, it confirms that any previous disequilibrium in the system will eventually converge at equilibrium at the adjustment speed of 45.6%. The PMG short-run results show that both external debt and its squared term are insignificant, which indicates that external debt does not influence interest rate in the short run. Similarly, trade openness has a positive and insignificant coefficient, which offers an indication that openness of the economies to trade has no impact on

interest rate in the short run. The coefficient of GDP growth is also positive and insignificant, which makes it evident that economic growth does not influence interest rate in the short run. Lastly inflation is proven to have a negative effect on interest rate in the short run, going by its negative and significant coefficient at the 1% level. Overall, the results of this robustness test are very similar to those of the main estimation.

Table 5.16: Interest rate model: Robustness test

Variable	ED = External Debt/Export		ED = Interest payment/Export	
	Coefficient	Std. Error	Coefficient	Std. Error
Long-run coefficients				
ED	0.000470***	0.000048	0.100802**	0.049233
$(ED)^2$	7.53E-07	5.64E-07	0.044977***	0.009953
TRD	0.003386**	0.001595	0.012773***	0.001714
GDPG	-0.174474***	0.065012	-0.005085	0.067134
INF	4.10927***	0.861635	0.753062***	0.032703
ECT	-0.4635***	0.088915	-0.4559***	0.078159
Short-run coefficients				
ΔED	0.023075	0.059626	-1.608994	1.063711
$\Delta(ED)^2$	0.000143	0.000394	0.307899	0.206968
ΔTRD	0.222068	0.222457	0.027172	0.028011
ΔGDPG	6.203129	4.54293	5.963568	4.40876
ΔINF	-2.260073***	0.552658	-0.346987***	0.058594
Observations	960		863	

Note: Dependent variable=Interest rate; ** and *** represent significance at 5% and 1%, respectively; ED=External debt variable; ED2=Squared term of external debt variable; TRD=Trade openness as a percentage of GDP; GDPG=GDP growth rate; INF=Inflation rate; ECT=Error correction term

5.4.4.9 Savings

Table 5.17 presents the results of panel ARDL estimations for the investigation of savings as a channel of transmission from external debt to economic growth. The panel ARDL estimation technique affords the estimation of the model by means of pooled mean group (PMG), mean group

(MG) and dynamic fixed effect (DFE) estimators; therefore, a Hausman-type test (Hausman, 1978) is employed to ascertain which of the three estimators is consistent and efficient for the model. The results of the test are recorded in columns 6 and 7 of Table 5.17. From the results, the null hypothesis that the difference between PMG and MG is insignificant cannot be rejected, as the probability value is greater than the 5% critical value. Hence, the PMG is adjudged the more consistent and efficient estimator over the MG. Furthermore, the null hypothesis that PMG and DFE estimates are not significantly different cannot be rejected, as the probability value is greater than the 5% critical value. This indicates that PMG remains the more efficient estimator, also when compared with DFE.

In the Table, the PMG results are reported in columns 2 and 3, while the MG results are to be found in columns 4 and 5. Further, columns 8 and 9 contain the DFE estimates. In each of these three models, the dependent variable is gross national savings as a percentage of GDP, while external debt as a percentage of GNI is the external debt variable. In light of the Hausman test's confirmation of PMG as the most efficient estimator in comparison with MG and DFE, analysis of the investigation of savings as a channel of transmission between external debt and economic growth will be based mainly on the PMG estimates.

In columns 2 and 3 of the Table, the long-run results of the PMG estimates make it clear that the external debt variable is negative and insignificant, while its squared term is positive and insignificant. This result indicates that external debt does not affect savings in the long-run, given the insignificance of both external debt variables. It also refutes the existence of a nonlinear relation between the two variables, which requires not only that the two variables bear opposite signs, but also that the two variables be statistically significant. Therefore, this result has demonstrated that savings does not constitute a channel through which external debt transmits its impact to economic growth in the long run. This result is in line with Schclarek (2004:13) and Schclarek and Ramon-Ballester (2005:15) who find no evidence that private savings is a channel of transmission from external debt to economic growth in developing countries and Latin America, respectively. It also corroborates Riffat and Munir (2015:28) whose finding suggests that savings is not a channel through which public debt affects economic growth. On the other hand, this finding opposes that of Checherita-Westphal and Rother (2012:1398) who demonstrate that savings

constitutes a channel through which public debt transmits a nonlinear effect to economic growth in the Euro area, with a threshold of debt/GDP ratio of between 61% and 82%.

The coefficient of log of GDP is also insignificant and negative, which confirms that economic growth has no impact on savings in the long run. Meanwhile, population growth is shown to have a positive effect on savings, going by its coefficient being positive and significant at the 1% level. This indicates that an increase in population is associated with higher levels of savings. The coefficient of human capital is negative and statistically significant at the 5% level, which demonstrates a negative effect of human capital on savings. The long-run PMG results are not totally supported by both the MG and DFE estimates, as none of the variables in both models is statistically significant; however, they both support the main finding of the PMG that savings is not a channel of transmission from external debt to economic growth.

The coefficient of the ECT is negative, less than one and significant at the 1% level. This indicates that the variables in the model are indeed cointegrated. Furthermore, it points to the fact that any previous deviation from equilibrium would be corrected at the adjustment speed of 42.2%. The short-run PMG results also indicate that both external debt variables are insignificant, which confirms that external debt has no impact on savings. These results also imply that savings is not a channel of transmission from external debt to economic growth in the short run. The coefficient of log of GDP is positive and significant at 10% level of significance. This indicates that unlike in the long run where economic growth depresses savings, economic growth enhances savings in the short run. The coefficient of population growth is negative and insignificant, while that of human capital is positive and insignificant, indicating that neither of the two variables affects savings in the short run.

Table 5.17: Savings model: Panel ARDL results

Variable	Pooled Mean Group		Mean Group		Hausman test		Dynamic Fixed Effect	
	Coefficient	Std. Error	Coefficient	Std. Error	h-test	prob.	Coefficient	Std. Error
Long-run coefficients								
ED	-0.014931	0.011949	1.384062	1.416165			0.009611	0.024683
$(ED)^2$	0.000019	0.000035	-0.10977	0.010867			-0.000052	0.000059
LGDP	-2.064452	1.865761					-3.22611	2.948006

Variable	Pooled Mean Group		Mean Group		Hausman test		Dynamic Fixed Effect	
	Coefficient	Std. Error	Coefficient	Std. Error	h-test	prob.	Coefficient	Std. Error
POP	1.28516***	0.475872	4.751959	4.849661			-0.429191	0.863089
HC	-0.21903**	0.092252	-0.036336	0.576557			0.263441	0.163149
MG vs PMG					1.37	0.8503		
DFE vs PMG					1.17	0.8828		
ECT	-0.4216***	0.061622	-0.6001***	0.179388			-0.4154***	0.026919
Short-run coefficients								
ΔED	0.482887	0.552106	3.29623	3.386892			-0.03421**	0.015263
$\Delta(ED)^2$	-0.005378	0.005224	-0.026843	0.027084			0.000036	0.000028
ΔLGDP	24.57932*	13.30751					13.99897***	4.743664
ΔPOP	-30.40113	31.68376	12.22265	16.1181			-0.594625	1.033344
ΔHC	1.295562	1.396984	0.365633	2.68433			0.240560	0.424403
Observations	960		960				960	

Note: Dependent variable=Gross national savings as a percentage of GDP; *, ** and *** represent significance at 10%, 5% and 1%, respectively; ED=External debt as a percentage of GNI; ED2=Squared term of external debt as a percentage of GNI; LGDP=Log of GDP per capita; POP=Population growth rate; HC=Human capital; ECT=Error correction term

5.4.4.10 Robustness checks

To assess the robustness of the PMG estimates, two additional panel ARDL models were estimated, based on the PMG estimator. In each of the models, gross national savings remains the dependent variable. Furthermore, each of the models was estimated with an alternative proxy of external debt to test the sensitivity of the main estimates to different external debt measures. The results of the robustness checks are reported in Table 5.18. In the Table, results for the model with external debt as a percentage of export as the external debt variable are reported in columns 2 and 3, while the model with interest payment on external debt as a percentage of export, as the external debt variable, is displayed in columns 4 and 5.

In columns 2 and 3, the long-run results of the model with external debt/export as external debt variable make clear that the coefficient of the external debt variable is positive and insignificant. The squared term of the external debt variable is equally insignificant, but negative. These results

indicate that external debt has no impact on savings in the long run. Further, they imply that savings does not constitute a channel for transmitting the nonlinear impact of external debt to economic growth in the long run. Therefore, this result affirms that the main PMG estimates are robust to alternative external debt measures. The coefficient of log of GDP is negative and insignificant, which demonstrates that economic growth does not affect savings in the long run. Meanwhile, the coefficients of population growth rate and human capital are both positive and significant at 5% and 10%, respectively. This implies that increase in both variables are associated with higher savings in the long run.

The coefficient of the ECT is negative, less than one and significant at the 5% level. This indicates that a long-run relationship exists among the variables in the model, and that any previous deviation from long-run equilibrium would be corrected at the adjustment speed of 33.6%. For the short-run results, the Table reveals that none of the variables is statistically significant in the short run. This indicates that savings is not influenced in the short run by any of the variables in the model.

Moving on to the model with external debt interest payment/export displayed in columns 4 and 5 of Table 5.18, the external debt and its squared term are proven to have negative and positive coefficients, respectively. Moreover, they are both statistically insignificant, which indicates that external debt does not affect savings in the long run. These results, therefore, suggest that savings does not comprise a channel of transmission from external debt to economic growth, in line with the claim in the main PMG estimation. The log of GDP is also insignificant and negative, which indicates that economic growth does not affect savings in the long run. However, both population growth rate and human capital have positive and significant coefficients at the 5% and 1% levels of significance, respectively. This indicates that both variables exert positive impact on savings in the long run.

The ECT is negative, less than one and significant at the 1% level, thereby confirming the existence of long-run relationship among the variables. This further implies that any previous deviation from long-run equilibrium would be corrected at the adjustment speed of 52%. The short-run results make it evident that the external debt variable and its squared term are positive and negative, respectively. Further, while the former is significant at 5%, the latter is significant at 10%. By this

result, a nonlinear effect of external debt on savings is confirmed, which by implication, suggests that savings is confirmed as a channel of transmission from external debt to economic growth in the short run. The log of GDP is positive and significant at the 1% level, which signifies that economic growth influences savings positively in the short run. Lastly, the coefficients of population growth rate and human capital are both insignificant, which implies that both variables have no impact on savings in the short run.

Table 5.18: Savings model: Robustness test

Variable	ED = External Debt/Export		ED = Interest payment/Export	
	Coefficient	**Std. Error**	**Coefficient**	**Std. Error**
Long-run coefficients				
ED	0.003539	0.001907	-0.057094	0.08954
$(ED)^2$	-2.30E-06	4.48E-06	0.004669	0.003813
LGDP	-1.393999	1.855785	-1.394817	1.314457
POP	1.373121**	0.587488	1.052003**	0.475886
HC	0.062120***	0.008688	0.061888***	0.007106
ECT	-0.3357**	0.141065	-0.5175***	0.056118
Short-run coefficients				
ΔED	-0.019996	0.081555	1.313787**	0.630766
$\Delta(ED)^2$	0.000674	0.000827	-0.223973*	0.135871
ΔLGDP	-0.119773	16.83597	27.80865***	9.668767
ΔPOP	-9.180273	12.53996	-0.543877	14.60096
ΔHC	1.614610	1.521330	0.384709	1.093891
Observations	960		863	

Note:; Dependent variable=Gross national savings as a percentage of GDP; *, ** and *** represent significance at 10%, 5% and 1%, respectively%; ED=External debt variable; ED2=Squared term of external debt variable; LGDP=Log of GDP per capita; POP=Population growth rate; HC=Human capital; ECT=Error correction term

5.5 THE ROLE OF INSTITUTIONS IN THE RELATIONSHIP BETWEEN EXTERNAL DEBT AND ECONOMIC GROWTH

This section is devoted to the analysis of how the quality of institutions influence the relationship between external debt and economic growth in SSA. In order to achieve this empirical objective, four different models are estimated. The first model employs the composite index of institutional quality as the institutional quality variable, while the second, third and fourth models employ the institutional quality variables of law and order, corruption and government stability, respectively.

The section begins by analysing a summary of descriptive statistics of all the variables employed in all the estimated models. This is followed by a correlation analysis of the variables. Further, panel unit root tests are conducted on all the variables to ascertain their statistical properties and, consequently, the suitability or otherwise of the estimation technique. After this, the panel ARDL estimation of each of the models is conducted to investigate the role of institutional quality in the relationship between external debt and economic growth in SSA. Lastly, robustness checks on the results of the panel ARDL estimations are conducted.

5.5.1 Descriptive analysis

Table 5.19 presents a summary of descriptive statistics of the variables employed in all the models. The mean GDP per capita and external debt/GNI stand at $1527.19 and 98.76. For the institutional quality variables, the composite index of institutional quality (range: 0-10) is averaged at 4.68/10, while law and order and corruption (range: 0-6) average out at 2.76 and 2.31, respectively. The mean of government stability (range: 0-12) stands at 7.29. The least score of institutional quality index of 0.53/10 was scored by Liberia in 1992, while the highest point of 7.36/10 was scored by Botswana for 1990. The mean values of investment, human capital and trade openness stand at 20.22% of GDP, 53.75 and 63.66 of GDP. Furthermore, the variance is quite large for each of the variables, as reflected by the huge differences in their respective maximum and minimum values. This is further established by the rather large standard deviation statistic for each variable.

Table 5.19: Descriptive statistics

Variable	Mean	Std. Deviation	Minimum	Maximum	Observations
GDP	1527.19	2155.93	131.65	12042.43	990

Variable	Mean	Std. Deviation	Minimum	Maximum	Observations
ED	98.76	128.15	3.89	1380.77	990
IQ	4.68	1.13	0.53	7.36	990
LO	2.76	0.99	0	5	990
CO	2.31	0.99	0	6	990
GS	7.29	2.23	1	11.58	990
INV	20.22	8.64	-2.42	74.61	990
HC	53.75	6.29	35.71	67.15	990
TRD	63.66	30.49	9.14	311.35	990

Note: GDP=GDP per capita (constant 2010US$); ED=External debt as a percentage of GNI; IQ=Composite index of institutional quality; LO=Law and order; CO=Corruption; GS=Government stability; INV=Gross fixed capital formation as a percentage of GDP (proxy for investment); HC=Life expectancy at birth (proxy for human capital); TRD=Trade openness as a percentage of GDP

5.5.2 Correlation analysis

Table 5.20 presents the correlation matrix of the variables in all the models. In general, the matrix demonstrates that all the variables are associated with the dependent variable, GDP per capita, as none of the variables is proven to have zero correlation in column 2 of the matrix. While most of the variables exhibit positive association with real GDP per capita, only external debt/GNI exhibit a negative association with it. Specifically, institutional quality composite index and all the three institutional variables, gross fixed capital formation, life expectancy at birth and trade openness all indicate positive association with GDP per capita.

Table 5.20: Correlation matrix

	GDP	ED	INS	LO	CO	GS	INV	TRD	HC
GDP	1.00								
ED	-0.15	1.00							
IQ	0.28	-0.37	1.00						
LO	0.01	-0.26	0.63	1.00					
CO	0.05	-0.06	0.51	0.29	1.00				
GS	0.11	-0.19	0.54	0.28	-0.04	1.00			
INV	0.25	-0.09	0.22	0.15	0.07	0.14	1.00		
TRD	0.26	0.24	0.13	-0.02	0.04	0.22	0.22	1.00	

	GDP	ED	INS	LO	CO	GS	INV	TRD	HC
HC	0.33	-0.28	0.36	0.12	-0.04	0.22	0.26	0.18	1.00

Note: GDP=GDP per capita (constant 2010US$); ED=External debt as a percentage of GNI; IQ=Composite index of institutional quality; LO=Law and order; CO=Corruption; GS=Government stability; INV=Gross fixed capital formation as a percentage of GDP (proxy for investment); HC=Life expectancy at birth (proxy for human capital); TRD=Trade openness as a percentage of GDP

5.5.3 Panel unit root tests

In order to establish the unit root status of each variable in the models, three panel unit root tests were employed: the Levin *et al.* (2002) test, the Im *et al.* (2003) test and the ADF Fisher test (suggested by Maddala and Wu (1999)). Table 5.21 records the test statistic and the probability values for the panel unit root tests for each of the variables. In the Table, the results for the LLC tests are presented in columns 2 and 3, while those of the IPS are in columns 4 and 5. Moreover, the results of the ADF Fisher tests are contained in the last two columns. Each of the three panel unit root tests operates under the null hypothesis that the series contain unit root; hence, if the probability value of the test statistic is less than the 5% critical value, then the null hypothesis is rejected and it is adjudged that the variable is stationary. If, contrariwise, the value of the test statistic's probability is greater than the 5% critical value, the variable is adjudged non-stationary.

As indicated in the Table, the test statistic and the respective probability values of the variables confirm that while some variables are stationary at level, several others become stationary, only at first difference. For example, all the three tests are in agreement that variables such as composite index of institutional quality, government stability index, institutional quality index, investment and human capital are stationary at level, while on the other hand, variables like log of GDP per capita, external debt/GNI, interaction term of external debt and institutional quality index and trade openness are all adjudged to be stationary at first difference. All the remaining variables are also adjudged to be either I(0) or I(1) by each of the panel unit root tests. These results indicate a case of mixed stationarity at level and first difference among the variables; this makes the panel ARDL approach very suitable for the estimations.

Table 5.21: Panel unit root tests

Variable	LLC test		IPS test		ADF Fisher test	
	Level	First Difference	Level	First Difference	Level	First Difference
LGDP	1.2205 (0.8889)	-6.6248*** (0.0000)	4.0335 (1.0000)	-10.744*** (0.0000)	50.9647 (0.7906)	240.368*** (0.0000)
ED	-0.1622 (0.4356)	-13.774*** (0.0000)	1.7675 (0.9614)	-14.761*** (0.0000)	41.5849 (0.9664)	327.399*** (0.0000)
IQ	-15.397*** (0.0000)	-15.397*** (0.0000)	-14.254*** (0.0000)	-14.254*** (0.0000)	312.218*** (0.0000)	312.218*** (0.0000)
ED*IQ	0.0837 (0.5333)	-12.9338*** (0.0000)	1.0346 (0.8496)	-13.7946*** (0.0000)	43.6702 (0.9441)	303.226*** (0.0000)
LO	-5.6119*** (0.0000)	-14.1653*** (0.0000)	-4.8827 (0.0000)	-13.6333*** (0.0000)	120.511 (0.0000)	280.165*** (0.0000)
ED*LO	-1.6380* (0.0507)	-13.2536*** (0.0000)	-0.7812 (0.2173)	-14.3986*** (0.0000)	61.2565 (0.4307)	319.086*** (0.0000)
CO	-3.9817*** (0.0000)	-15.1113 (0.0000)	-3.4051*** (0.0003)	-14.8021*** (0.0000)	89.4642*** (0.0081)	326.333*** (0.0000)
ED*CO	-0.9253 (0.1774)	-14.0918*** (0.0000)	-1.5956* (0.0557)	-13.8849*** (0.0000)	77.2539* (0.0662	303.837*** (0.0000)
GS	-4.2130*** (0.0000)	-10.2272*** (0.0000)	-2.0436** (0.0205)	-10.5545*** (0.0000)	67.1947* 0.0764	177.400*** (0.0000)
ED*GS	-2.7808*** (0.0027)	-13.7648*** (0.0000)	-1.1634 (0.1223)	-14.0820*** (0.0000)	66.3495 (0.1622)	301.076*** (0.0000)
INV	-2.599*** (0.0047)	-11.258*** (0.0000)	-2.764*** (0.0029)	-15.179*** (0.0000)	96.5374*** (0.0019)	319.522*** (0.0000)
HC	-23.276*** (0.0000)	-7.195*** (0.0000)	-9.192*** (0.0000)	-12.833*** (0.0000)	517.970*** (0.0000)	521.457*** (0.0000)
TRD	1.0580 (0.8550)	-11.353*** (0.0000)	-1.0558 (0.1455)	-15.349*** (0.0000)	70.1883 (0.1731)	324.427*** (0.0000)

Note: Figures in parenthesis indicate probability values; *, ** and *** represent significance at 10%, 5% and 1%, respectively; LLC=Levin, Li and Chu ; IPS=Im, Pesaran and Shin; ADF=Augmented Dickey-Fuller; LGDP=Log of GDP per capita ; ED=External debt as a percentage of GNI; IQ=Institutional quality composite index; ED*IQ=Interaction term of external debt and institutional quality index; LO=Law and order index; ED*LO=Interaction term of external debt and law and order index; CO=Corruption index; ED*CO=Interaction term of external debt and corruption index ; GS=Government stability index; ED*GS=Interaction term of external debt and government stability index; INV=Gross fixed capital formation as a percentage of GDP (proxy for investment); HC=Life expectancy at birth (proxy for human capital); TRD=Trade openness as a percentage of GDP

5.5.4 Estimation and discussion

The role of institutional quality in the relationship between external debt and economic growth has recently become prominent in the literature, with a number of studies looking in this direction, especially for the developed countries. Attempts on these lines for sub-Saharan African countries, however, are few and far between. Particularly, no previous study had investigated and determined the minimum level of institutional quality required for external debt to enhance economic growth

in SSA countries, which, in addition to examining the effect on institutions on external debt-economic growth nexus, is a focus in this section.

To achieve this objective, a panel ARDL approach, suggested by Pesaran and Smith (1995) and Pesaran *et al.* (1999), is employed to estimate equation 4.28; the results are presented in Table 5.22. The panel ARDL approach enables the estimation of the equation by three different estimators: the pooled mean group (PMG) estimator proposed by Pesaran *et al* (1999), the mean group (MG) estimator developed by Pesaran and Smith (1995), and the dynamic fixed effects (DFE) estimator. Furthermore, as noted, four different models were estimated, with the first one focusing on the impact of the institutional quality composite index. The second, third and fourth models concentrate on the impact of law and order, corruption, and government stability, respectively. In each of the models, the dependent variable is the log of GDP per capita, a proxy for economic growth.

A Hausman-type test (Hausman, 1978) is employed to determine the most consistent and efficient of the three estimators for each of the models. The results of the test are presented in the Table, with their respective probability values in parenthesis. From the results, the null hypothesis that the difference between PMG and MG is insignificant cannot be rejected for each of the models, as the probability value is greater than the 5% critical value. Hence, the PMG is adjudged more consistent and efficient estimator over the MG for each model. Furthermore, the null hypothesis that PMG and DFE estimates are not significantly different cannot be rejected for each model, as the probability value is greater than the 5% critical value. This indicates that PMG remains the more efficient estimator, when compared with DFE. Having established the PMG as the efficient model for all the models, the estimation analyses will, therefore, be based mainly on the PMG estimates, which are displayed in Table 5.22.

Results from model (1) which point to the effect of the institutional quality composite index are to be found in columns 2 and 3 of the Table. From the long-run estimates, the coefficient of external debt is negative and significant at 1% level of significance, which bespeaks a negative effect of external debt on economic growth in the long run. On the other hand, that of the interaction term between external debt and institutional quality composite index is positive and significant at 1% significance level. These results prove that in the long run, while external debt exerts negative

impact on economic growth, the quality of institutions mitigates this negative impact. Put differently, while increase in external debt stock depresses growth, this adverse effect is reduced in countries with more improved institutional environments, in terms of the 6 variables constituting the index. Furthermore, the results affirm that for external debt to enhance economic growth, SSA countries must attain a level of institutional quality that is higher than the threshold of 5.1/10 (0.0071/0.00139 = 5.11), in line with equation (4.29). These results, therefore, suggest that the negative impact of external debt is significant because of the low level of institutional quality in most SSA countries. From the descriptive statistics of variables, the average institutional quality composite index for the sample stands at 4.68/10, which is below the threshold. Specifically, increase in external debt stock would most likely hamper economic growth in those members of the sample, each of whose average institutional quality composite index falls below the threshold level. On the other hand, in countries such as Botswana, Gambia, Ghana, Kenya, Madagascar, Senegal, South Africa and Tanzania with average institutional quality indexes of 6.6/10, 5.5/10, 5.3/10, 5.4/10, 5.4/10, 5.2/10, 6.3/10 and 5.4/10, respectively, external debt would most likely enhance economic growth in the long run.

The coefficient of institutional quality is positive and significant at 1% significance level, which indicates that in the long run, improvement in the quality of institutions is associated with higher economic growth in SSA. This result is in line with findings in some previous studies (Acemoglu *et al.*, 2002:1231; Acemoglu *et al.*, 2005:462; Borrmann *et al*., 2006:360; Ouedraogo, 2015:137; Rodrik, 1998:12; Rodrik *et al*., 2004:137; Vitola & Senfelde, 2015:277) who argue that institutions play a pivotal role in the attainment of long-run economic growth across the world. Investment and human capital also have positive and significant coefficients at the 1% level, which reflects positive effect of both variables on economic growth in the long run. On the other hand, trade openness is negative and significant at 5% level of significance, which indicates that opening the economies more fully to trade depresses economic growth in the long run.

The ECT is indicated to have a negative, less than one and significant (at 5% significance level) coefficient. This confirms that the variables in the model indeed have a long-run relationship. Furthermore, it implies that any previous deviation from equilibrium would be corrected at a rather slow adjustment speed of 2.6%. The short-run estimates of the model show that the coefficient of external debt is negative and significant at 10% level of significance. This indicates that increase

in external debt stock depresses economic growth, also in the short run. The coefficient of the interaction term between external debt and institutional quality is, however, positive and statistically insignificant, which signifies that institutional quality has no impact on the relationship between external debt and economic growth in the short run. This result is further corroborated by the insignificance of the institutional quality variable, which makes clear that institutional quality has no impact on economic growth in the short run. In like manner, the coefficients of investment and trade openness are positive and insignificant, which points to the fact that both variables do not affect economic growth in the short run. Meanwhile, human capital is positive and significant at 10% significance level, which affirms that it positively influences economic growth, even in the short run.

The results of model (2) which focuses on the impact of law and order on external debt-economic growth nexus are reported in columns 4 and 5 of Table 5.22. The long-run estimates show that external debt has a negative impact on economic growth, given its negative and significant (at the 1% level) coefficient. Furthermore, the interaction term of external debt and law and order is positive and significant at 1% significance level, which indicates a positive effect of institutional quality on the external debt-economic growth nexus. These results imply that in the long run, while external debt exerts a negative impact on economic growth, this negative impact is palliated by improvement in law and order. In other words, while increase in external debt stock depresses economic growth, this adverse effect is reduced in countries with high levels of law and order. Furthermore, the results demonstrate that, in order for external debt to enhance economic growth, SSA countries must attain a level of law and order that is higher than the threshold of 2.9/6 (0.0053/0.00183 = 2.896). These results, therefore, suggest that the negative impact of external debt is significant because of the low level of law and order in most SSA countries. From the descriptive statistics of variables, the average law and order index for the sample stands at 2.76/6, which is below the threshold. The coefficient of law and order is also positive and significant at 1%, indicating that higher levels of law and order are associated with increases in economic growth. Further, the coefficients of investment and human capital are positive and statistically significant at the 1% level, in line with the estimates of model (1), but that of trade openness is insignificant.

The coefficient of the ECT is negative, less than one, and significant at the 5% level, thereby confirming the existence of a long-run association among the variables in the model. It further indicates that any past deviation from equilibrium would be corrected at the adjustment speed of 3.5%. The short-run estimates of the model demonstrate that the coefficient of external debt is negative and significant at 1% level of significance. This implies that increase in external debt stock depresses economic growth, also in the short run. The coefficient of the interaction term between external debt and law and order is positive and statistically significant at the 1% level, which indicates that law and order has an impact on the relationship between external debt and economic growth, in the short run as well. Furthermore, the results point out that, in order for external debt to enhance economic growth in the short run, SSA countries must attain a level of law and order that is higher than the threshold of 4.6/6 (0.0018/0.00039 = 4.62). Below this level of law and order, external debt hampers economic growth in the short run in SSA countries. This result is further supported by the positive sign and significance of the law and order variable, though at the 10% level, which indicates that improvement in law and order enhances economic growth in the short run. Furthermore, the coefficients of investment and trade openness are positive and insignificant, which proves that both variables do not affect economic growth in the short run. Meanwhile, human capital is positive and significant at 10% significance level, which shows that it positively influences economic growth, also in the short run.

Model (3) focuses on the impact of corruption on relationship between external debt on economic growth; the estimates are to be found in columns 6 and 7 of Table 5.22. The corruption index is measured by the ICRG in such a manner that the higher the corruption index values a country attains, the lower the level of corruption, and vice-versa. The long-run results demonstrate that external debt has a negative coefficient, which is significant at 1%. This indicates that external debt depresses economic growth in the long run. On the other hand, the interaction term of external debt and corruption is positive and significant at 1%, identifying the positive effect of corruption control on the external debt-economic growth nexus. These results imply that in the long run, while external debt exerts a negative impact on economic growth, this negative impact is reduced by an improvement in corruption index. In other words, while increase in external debt stock depresses economic growth, this adverse effect is reduced in countries with lower levels of corruption. Furthermore, the results affirm that, in order for external debt to enhance economic growth, SSA must attain a level of corruption control that is higher than the threshold of 3.3/6 (0.0053/0.00159

= 3.33). These results, therefore, suggest that the negative impact of external debt is significant because of the high level of corruption in most SSA countries. From the descriptive statistics of variables, the average corruption index for the sample stands at 2.31/6, which is below the threshold. The coefficient of corruption index is also positive and significant at 1%, indicating that lower levels of corruption are associated with increase in economic growth. Further, the coefficients of investment, trade openness and human capital are positive, negative and positive, respectively. Also, they are all statistically significant at the 1%, 5% and 1% significance levels, respectively, in line with the estimates of models (1) and (2).

The ECT is negative, less than one and significant at 1%, which indicates that the variables in the model are related in the long run. Moreover, this implies that any disequilibrium in the previous period would be corrected at the adjustment speed of 2.3%. For the short-run estimates, only human capital is significant (at 10%) and also positive, which indicates that improvement in human capital enhances economic growth in the short run. All the remaining variables are insignificant, which makes it clear that none of them influences economic growth in the short run.

Turning to model (4), which investigates the role of government stability on external debt-economic growth nexus, this is presented in columns 8 and 9. The long-run results demonstrate that external debt is negative and significant at 1%, which indicates a negative effect of external debt on economic growth. Further, the interaction term of external debt and government stability is positive and significant at 1%, which conveys a positive effect of government stability on external debt-economic growth nexus. These results imply that in the long run, while external debt exerts a negative impact on economic growth, this negative impact is palliated by higher stability in governance. In other words, while increase in external debt stock depresses economic growth, this adverse effect is reduced in countries with a high government stability index. Furthermore, the results confirm that, in order for external debt to enhance economic growth, SSA countries must attain a level of government stability that is higher than the threshold of 11.6/12 (0.0043/0.00037 = 11.62). These results, therefore, suggest that the negative impact of external debt is significant because of the low level of law and order in most SSA countries. From the descriptive statistics of variables, the average government stability index for the sample stands at 7.29/12, which is below the threshold. The coefficient of government stability index is also positive and significant at 1%, indicating that higher levels of government stability are associated with increase in economic

growth. Further, the coefficients of investment and human capital are positive and statistically significant at the 1% level, in line with the estimates of models (1), (2) and (3).

The ECT is negative, less than one, and significant at 1% significance level, which proves that the variables in the model are indeed related in the long run. Furthermore, this indicates that any past deviation from equilibrium in the system would be corrected at the adjustment speed of 3.2%. The short-run results show that none of the variables is significant. This reveals that all the variables have no influence on economic growth in the short run.

Table 5.22. Growth models: PMG results

Variable	(1)		(2)		(3)		(4)	
	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
Long-run coefficients								
ED	-0.0071***	0.00177	-0.0053***	0.00105	-0.0053***	0.00156	-0.0043***	0.00102
INV	0.05179***	0.00679	0.04586***	0.00572	0.06429***	0.01133	0.05019***	0.00562
TRD	-0.00278**	0.00138	-0.00163	0.00120	-0.00372**	0.00165	-0.00117	0.00133
HC	0.02198***	0.00528	0.01095***	0.00408	0.04271***	0.00913	0.14609***	0.04140
ED*IQ	0.00139***	0.00036						
IQ	0.14651***	0.03887						
ED*LO			0.00183***	0.00037				
LO			0.12790***	0.03588				
ED*CO					0.00159***	0.00052		
CO					0.17353***	0.05729		
ED*GS							0.00037***	0.00013
GS							0.04873***	0.01557
Hausman test								
MG vs PMG	1.71	(0.7889)	3.92	(0.4172)	4.10	(0.2031)	3.10	(0.5414)
DFE vs PMG	0.05	(0.9997)	0.06	(0.9995)	0.01	(1.0000)	0.20	(0.9998)
ECT	-0.0259**	0.01179	-0.0353**	0.01376	-0.0232***	0.00742	-0.0319**	0.01274

Variable	(1)		(2)		(3)		(4)	
	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
Short-run coefficients								
ED	-0.00129*	0.00074	-0.0018***	0.00051	-0.00090	0.00063	-0.00105	0.00065
INV	0.00068	0.00067	0.00042	0.00069	0.00066	0.00054	0.00042	0.00066
TRD	0.00010	0.00031	0.00013	0.00026	0.00031	0.00026	0.00031	0.00025
HC	0.01185*	0.00680	0.01146*	0.00587	0.01141*	0.00690	0.00531	0.03948
ED*IQ	0.00009	0.00012						
IQ	0.00612	0.01266						
ED*LO			0.00039***	0.00015				
LO			0.02809*	0.01522				
ED*CO					0.00005	0.00012		
CO					-0.00697	0.00887		
ED*GS							0.00003	0.00004
GS							0.00402	0.00261
Observations	960		960				960	

Note: Dependent variable=Log of GDP per capita; *, ** and *** represent significance at 10%, 5% and 1%, respectively%; ED=External debt stocks as a percentage of GNI; IQ=Composite index of institutional quality; ED*IQ=Interaction term of external debt and institutional quality index; LO=Law and order index; ED*LO=Interaction term of external debt and law and order index; CO=Corruption index; ED*CO=Interaction term of external debt and corruption index ; GS=Government stability index; ED*GS=Interaction term of external debt and government stability index; INV=Gross fixed capital formation as a percentage of GDP (proxy for investment); HC=Life expectancy at birth (proxy for human capital); TRD=Trade openness as a percentage of GDP; ECT=Error correction term

5.5.5 Robustness checks

As a method of verifying the robustness of the PMG estimates, a different set of models were estimated, with a different data set (spanning 1996 to 2017) which enables an examination of the sensitivity of the PMG results to alternative proxies of institutional quality, known as the WGI, provided by the World Bank (2018). Four different models were estimated, with the first one focusing on the impact of the institutional quality composite index. To measure the quality of institutions, a composite index of institutional quality was constructed as the average of the six governance indicators provided by the World Bank (2018); it will be recalled that these are control of corruption, voice and accountability, political stability, government effectiveness, regulatory quality and rule of law. Each of these indicators ranges from -2.5 (weak governance performance) to 2.5 (strong governance performance). The second, third and fourth models focus on the impact

of regulatory quality, corruption control, and government effectiveness, respectively. In each of the models, the dependent variable is growth rate of GDP, a proxy for economic growth.

As a completely different dataset was employed for this robustness test, it is necessary to analyse the features of this dataset, beginning with descriptive statistics, proceeding to correlation analysis, and then to panel unit root tests. A summary of the descriptive statistics of the dataset is presented in Table 5.23 which records the mean values of GDP growth rate and external debt/GNI as 4.56% and 82.86%, respectively. The minimum/maximum values of both variables stand at -30.16%/26.85% and 3.89%/1380.77%, respectively. The average composite index of institutional quality stands at -0.69/2.5, which reflects a very low score for the sampled countries. As a matter of fact, the highest institutional quality point is 0.88/2.5, which was recorded by Botswana in 2003. This figure is still a far cry from the highest mark of 2.5. Overall, the variance of all the variables is quite high, given the large differences between the maximum and minimum values, which is further reflected in the standard deviation values.

Table 5.23: Descriptive statistics

Variable	Mean	Std. Deviation	Minimum	Maximum	Observations
GDPG	4.56	4.68	-30.15	26.85	655
ED	82.68	130.77	3.89	1380.77	660
IQ	-0.69	0.54	-2.10	0.88	570
RQ	-0.67	0.56	-2.3	0.8	570
CC	-0.73	0.52	-1.72	1.22	570
GE	-0.78	0.52	-1.88	1.02	570
INV	20.71	8.26	-2.42	74.61	660
TRD	67.32	31.97	17.86	311.35	660
POP	2.71	0.68	0.18	7.85	660

Note: GDPG=GDP growth rate (annual percentage); ED=External debt as a percentage of GNI; IQ=Composite index of institutional quality; RQ=Regulatory quality; CC=Corruption control; GE=Government effectiveness; INV=Gross fixed capital formation as a percentage of GDP (proxy for investment); TRD=Trade openness as a percentage of GDP; POP=Population growth rate

The correlation coefficients of the variables are presented in Table 5.24. Overall, the matrix illustrates that all the variables are associated with the dependent variable, namely GDP growth rate, as none of the variables is shown to have zero correlation with it. While two of the variables,

namely external debt and trade openness exhibit negative association with GDP growth rate, the remaining variables exhibit positive association with it. Specifically, all institutional quality variables, gross fixed capital formation and population growth rate have positive correlations with GDP growth rate.

Table 5.24: Correlation matrix

	GDPG	ED	IQ	RQ	CC	GE	INV	TRD	POP
GDPG	1.00								
ED	-0.22	1.00							
IQ	0.07	-0.24	1.00						
RQ	0.07	-0.29	0.91	1.00					
CC	0.07	-0.17	0.91	0.80	1.00				
GE	0.05	-0.23	0.89	0.86	0.85	1.00			
INV	0.21	-0.11	0.21	0.21	0.22	0.23	1.00		
TRD	-0.01	0.42	0.01	-0.12	0.03	-0.11	0.18	1.00	
POP	0.27	-0.04	-0.15	-0.11	-0.27	-0.28	0.17	0.01	1.00

Note: GDPG=GDP growth rate (annual percentage); ED=External debt as a percentage of GNI; IQ=Composite index of institutional quality; RQ=Regulatory quality; CC=Corruption control; GE=Government effectiveness; INV=Gross fixed capital formation as a percentage of GDP (proxy for investment); TRD=Trade openness as a percentage of GDP; POP=Population growth rate

Table 5.25 reports the results of the panel unit root tests conducted on the variables. As indicated in the Table, the test statistic and the respective probability values of the variables point out that while some variables are stationary at level, others become stationary, only at first difference. For example, all the three tests are in agreement that variables such as GDP growth rate, government effectiveness, investment population growth rate and all the interaction variables are stationary at levels, while on the other hand, variables like corruption control and trade openness are adjudged to be stationary at first difference. All the remaining variables are also adjudged to be either I(0) or I(1) by each of the panel unit root tests. These results indicate that we have a case of mixed stationarity at level and first difference among the variables, and that makes the panel ARDL approach very suitable for the analysis.

Table 5.25: Panel unit root tests

Variable	LLC test		IPS test		ADF Fisher test	
	Level	First Difference	Level	First Difference	Level	First Difference
GDPG	-4.8458*** (0.0000)	-17.8113*** (0.0000)	-7.1054*** (0.0000)	-19.9085*** (0.0000)	158.744*** (0.0000)	440.024*** (0.0000)
ED	-2.9362*** (0.0017)	-6.6198*** (0.0000)	0.9941 (0.8399)	-8.3096*** (0.0000)	39.6417 (0.9803)	184.454*** (0.0000)
ED*IQ	-9.4896*** (0.0000)	-4.1506*** (0.0000)	-3.7767*** (0.0001)	-3.8618*** (0.0001)	112.982*** (0.0000)	102.556*** (0.0005)
IQ	-2.8798*** (0.0020)	-6.7435**** (0.0000)	-0.4682 (0.3198)	-8.0385*** (0.0000)	61.9442 (0.4066)	175.957*** (0.0000)
ED*RQ	-6.9834*** (0.0000)	-6.9063*** (0.0000)	-3.4979*** (0.0002)	-5.5291*** (0.0000)	106.695*** (0.0002)	132.229*** (0.0000)
RQ	-2.0996** (0.0179)	-8.3911*** (0.0000)	-0.9400 (0.1736)	-8.2096*** (0.0000)	65.8832 (0.2807)	178.358*** (0.0000)
ED*CC	-8.4285*** (0.0000)	-4.5166*** (0.0000)	-3.5019*** (0.0002)	-4.1569*** (0.0000)	106.167*** (0.0002)	108.838*** (0.0001)
CC	-0.7056 (0.2402)	-4.4323*** (0.0000)	-0.3741 (0.3542)	-6.4556*** (0.0000)	67.5479 (0.2350)	145.408*** (0.0000)
ED*GE	-7.4119*** (0.0000)	-5.5055*** (0.0000)	-3.6649*** (0.0001)	-5.1118*** (0.0000)	106.972*** (0.0002)	124.235*** (0.0000)
GE	4.5417*** (0.0000)	-12.5498*** (0.0000)	-2.8632** (0.0021)	-10.8234*** (0.0000)	101.158*** (0.0007)	221.714*** (0.0000)
INV	-2.9792*** (0.0014)	-12.0831*** (0.0000)	-2.4517*** (0.0071)	-11.4575*** (0.0000)	93.6158*** (0.0036)	244.120*** (0.0000)
TRD	-0.0523 (0.4791)	-9.6906*** (0.0000)	-0.3223 (0.3736)	-11.4227*** (0.0000)	51.9572 (0.7606)	244.782*** (0.0000)
POP	-18.3680*** (0.0000)	-18.3079*** (0.0000)	-22.2592*** (0.0000)	-20.9093*** (0.0000)	577.620*** (0.0000)	510.854*** (0.0000)

Note: Figures in parenthesis indicate probability values; *, ** and *** represent significance at 10%, 5% and 1%, respectively; LLC=Levin, Li and Chu ; IPS=Im, Pesaran and Shin; ADF=Augmented Dickey-Fuller; GDPG=GDP growth rate (annual percentage); ED=External debt as a percentage of GNI; ED*IQ=Interaction term of external debt and composite index of institutional quality; IQ=Composite index of institutional quality; ED*RQ=Interaction term of external debt and regulatory quality; RQ=Regulatory quality; ED*CC=Interaction term of external debt and corruption control; CC=Corruption control; ED*GE=Interaction term of external debt and government effectiveness; GE=Government effectiveness; INV=Gross fixed capital formation as a percentage of GDP (proxy for investment); TRD=Trade openness as a percentage of GDP; POP=Population growth rate

Table 5.26 reports the PMG estimates for the four models proposed to test the robustness of the main results. The first model which examines the role of institutional quality on external debt-economic growth relationship is contained in columns 2 and 3. The long-run results make it clear that while external debt is negative and significant at the level of 1%, the interaction term is positive and significant at 1%. These results indicate that though external debt depresses economic growth in the long run, institutions mitigate this negative effect in countries with improved quality of institutions. This result is very much in line with the main finding, thereby confirming the robustness of the results to alternative measures of institutional quality. Furthermore, the minimum

level of governance indicators that SSA countries must attain if they are to benefit from external debt accumulation is computed at 1.3/2.5 (0.0692/0.05439 = 1.27). This threshold value shows that external debt is deleterious to economic growth in such countries because of their general low score in governance indicators, as the average composite index of the indicators for the sample is -0.69/2.5, for the study period, which is very low when compared to the highest possible score of 2.5. The coefficients of institutional quality composite index and investment are positive and significant at the 1% level, which indicates that improvements in both variables are associated with higher growth for the economy in the long run. Trade openness is also positive and significant but at the level of 10%, which shows that it enhances economic growth in the long run. Meanwhile, population growth is insignificant, which affirms that it has no impact on economic growth in the long run.

The ECT is negative, less than one and significant at 1%, signalling the cointegration of all the variables in the model. This furthermore indicates that previous errors in the model would be corrected in the current period at an adjustment speed of 78.7%. The short-run results show that coefficients of all the variables are insignificant, indicating that none of the variables influence economic growth in the short run.

The long-run results of models (2), (3) and (4) indicate that external debt has a negative effect on economic growth, going by its negative and significant (at 1% significance level) coefficient in each of the models. Furthermore, the negative effects of external debt on economic growth are mitigated by regulatory quality, corruption control, and government effectiveness, respectively, in SSA, considering their respective positive and significant (at 1% significance level) coefficients. Put differently, while increase in external debt stock depresses growth, this adverse effect is reduced in countries with more improved regulatory quality, corruption control and government effectiveness. Furthermore, the results confirm that, in order for external debt to enhance economic growth, SSA must attain levels of regulatory quality, corruption control and government effectiveness that are higher than the thresholds of 0.7/2.5 (0.0446/0.0634 = 0.70), 1.1/2.5 (0.0254/0.02279 = 1.11), and 1.05/2.5 (0.0822/0.07822 = 1.05), respectively. These results, therefore, suggest that the negative impact of external debt is significant because of the low levels of governance indicators in most SSA countries. From the descriptive statistics of variables, the average scores of regulatory quality, corruption control and government effectiveness for the

sampled countries stands at -0.67/2.5, -0.73/2.5 and -0.78/2.5, respectively, which fall below their respective thresholds. These results generally support the main findings as reported in the previous section, and this implies that the results are robust to alternative proxies of institutional quality.

The ECT in each of the models is negative, less than one and significant at the 1% level, which indicates that all the variables in each of these models have a long-run relationship. Furthermore, this suggests that any previous deviation from equilibrium would be corrected at the adjustment speeds of 77.9%, 96.5% and 92.6% for models (2), (3) and (4), respectively. Just as with the main results, the short-run estimates are mostly insignificant, with only external debt, investment and trade openness being significant for models (2), (3) and (4), respectively. All the remaining variables are insignificant, thereby indicating that they have no impact on economic growth in the short run.

Overall, the results of the robustness tests are quite similar to those of the main regression, hence, confirming that the estimates are robust to alternative institutional quality measures.

Table 5.26: Growth models: Robustness test

Variable	(1)		(2)		(3)		(4)	
	Coefficient	**S. Error**	**Coefficient**	**S. Error**	**Coefficient**	**S. Error**	**Coefficient**	**S. Error**
Long-run coefficients								
ED	-0.0692***	0.00592	-0.0446***	0.00735	-0.0254***	0.00687	-0.0822***	0.00697
INV	0.1332***	0.01626	-0.1602***	0.02685	0.02686***	0.01027	0.04168***	0.01037
TRD	0.01147*	0.00589	0.05803***	0.01315	-1.17397	0.83790	0.07411**	0.03684
POP	-0.03876	0.64218	0.33582	0.77400	-0.06663	0.04396	-1.98837**	0.80928
ED*IQ	0.05439***	0.00558						
IQ	3.37445***	0.79867						
ED*RQ			0.0634***	0.00889				
RQ			2.63812***	0.69937				
ED*CC					0.02279***	0.00786		
CC					1.7378***	0.61242		
ED*GE							0.07822***	0.00636
GE							2.45735***	0.75804

ECT	-0.7873***	0.07505	-0.7791***	0.08359	-0.9654***	0.06685	-0.9264***	0.05879
Short-run coefficients								
ED	-0.20476	0.13310	-0.14558*	0.08712	-0.21806	0.21556	-0.13479	0.10242
INV	-0.12456	0.09787	0.25686	0.16346	0.15889**	0.08027	-0.32240	0.36402
TRD	0.03595	0.04699	0.00258	0.04094	-5.79006	9.29607	1.37089*	0.76415
POP	1.57091	7.53455	-6.34134	7.47451	0.84297	0.62950	-8.81185	11.0686
ED*IQ	-0.04254	0.14458						
IQ	14.81041	11.16658						
ED*RQ			-0.04017	0.09969				
RQ			2.82069	3.89179				
ED*CC					0.07789	0.19413		
CC					2.75718	9.75867		
ED*GE							-0.23522	0.21366
GE							7.88929	6.89661
Observations	660		660				660	

Note: Dependent variable=Growth rate GDP (annual percentage); *, ** and *** represent significance at 10%, 5% and 1%, respectively%; ED=External debt stocks as a percentage of GNI; IQ=Composite index of institutional quality; ED*IQ=Interaction term of external debt and institutional quality index; RQ=Regulatory quality; ED*RQ=Interaction term of external debt and regulatory quality; CC=Corruption control; ED*CC=Interaction term of external debt and corruption control; GE=Government effectiveness; ED*GE=Interaction term of external debt and government effectiveness; INV=Gross fixed capital formation as a percentage of GDP (proxy for investment); TRD=Trade openness as a percentage of GDP; POP=Population growth rate; ECT=Error correction term

5.6 CONCLUSION

This Chapter focused on the estimation of the various models set up to achieve the empirical objectives of the study. The first set of models was aimed at investigating the nonlinear effect of external debt on economic growth in SSA. Results from the various estimations demonstrate that external debt indeed exerts a nonlinear effect on economic growth in the sample of SSA countries. Further, it was found that the relationship between the two variables follows an inverted U-shaped pattern, which implies that external debt at moderate levels enhances economic growth, before reaching a tipping point beyond which it becomes deleterious to economic growth. This threshold of external debt was estimated at 43% of GNI. This result was also established to be robust to

alternative measures of external debt, namely external debt as a percentage of export, interest payment on external debt as a percentage of export and total external debt stock, with the threshold of external debt beyond which it begins to exert negative effect on economic growth estimated at 306% of export, 34% of export and $5.1billion, respectively.

The second set of models was set up to identify the channels through which external debt transmits its nonlinear effect to economic growth. Findings from the various estimations affirm that private investment, public investment and total factor productivity constitute channels through which nonlinear effect of external debt is transmitted to economic growth, with the results of the first two variables being established to be robust to alternative measures of external debt, while those of the total factor productivity are not found to be robust. Hence, there is only a weak evidence that total factor productivity transmits a nonlinear effect, rather than linear effect from external debt to economic growth. Furthermore, while interest rate was found to transmit linear and positive effect from external debt to economic growth, savings was not established to be a channel of transmission between the two variables.

The last set of models was employed to investigate the role of institutional quality in the relationship between external debt and economic growth. Results from the various regressions confirm that while external debt exerts a negative effect on economic growth, institutional quality mitigates this negative effect in countries with good institutions. Furthermore, the minimum level of institutional quality beyond which external debt becomes beneficial to economic growth was estimated at 5.1/10. These results are also found to be robust to alternative measures of institutional quality. In the next chapter, the thesis will be concluded with a summary of and conclusions to the research, as well as the recommendations arising from it.

Table 5.27: Summary of findings

Objective	Major findings
1. Examination of the nonlinear effect of external debt on economic growth in SSA.	-External debt exerts a nonlinear impact on economic growth in SSA. -External debt does not affect economic growth in the short run. -Relationship between external debt and economic growth in the long run is found to be hump-shaped or inverted U-shaped. -The threshold of external debt beyond which it becomes deleterious to economic growth is estimated at 43% of GNI, 306% of export, 34% of export and $5.1billion for external debt variables of external debt/GNI, external debt/export, interest payment on external debt/export and total external debt stocks, respectively.

Objective	Major findings
2. Determination of channels of transmission from external debt to economic growth in SSA.	-Private investment, public investment and total factor productivity are established as the channels through which external debt transmits a nonlinear effect to economic growth in the long run. -Interest rate is established as a channel through which external debt transmits a linear and negative effect to economic growth in the long run. -It is also established that savings does not constitute channel of transmission between external debt and economic growth in SSA.
3. Investigation of the role of institutional quality in the relationship between external debt and economic growth in SSA.	-Institutional quality (measured by the composite index of institutional quality indexes provided by ICRG and WGI) mitigates the negative effect of external debt on economic growth in SSA. -Institutional quality (measured by selected individual indexes, namely corruption, corruption control, government effectiveness, government stability, law and order, and regulatory quality) mitigates the negative effect of external debt on economic growth in SSA. -The minimum level of institutional quality that SSA countries need to attain for external debt to enhance economic growth is estimated at 5.1/10 and 1.3/2.5 of ICRG and WGI composite indexes, respectively. -For the selected institutional quality variables, SSA countries must attain a minimum level of 3.3/6, 1.1/2.5, 1.05/2.5, 11.6/12, 2.9/6, 0.7/2.5 of corruption, corruption control, government effectiveness, government stability, law and order, and regulatory quality respectively, for external debt to enhance economic growth.

CHAPTER 6

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

This is the last chapter of the thesis, and it contains the various elements that constitute the study. The study examined the relationship between external debt, institutional quality and economic growth in SSA countries; therefore, this chapter discusses the summary, conclusions and policy recommendations emanating from the study. The chapter comprises eight sections, starting with providing a summary of the entire thesis. This is followed by a section featuring how the objectives that the study set out to achieve, were realised in the thesis. The next section highlights a set of policy implications emanating from the study, after which the contributions of the study to the body of literature are itemised. The last three sections present limitations of the study, opportunities for further research on the subject and final remarks, respectively.

6.2 SUMMARY OF THESIS

The study comprises six chapters. As stated above, the research investigated the relationship between external debt, institutional quality and economic growth in SSA; consequently, in the first chapter, **Chapter 1**, the rationale for the study, was introduced through a discussion of the relevant issues and developments. It began by providing background information and elaborating upon the issues giving rise to the study. This was followed by a presentation of the statement of the research problem, objectives of the study, significance and contributions of the study and ethical considerations. Indeed, Chapter 1 provided the groundwork for the study.

Chapter 2 presented a profile of external debt in SSA by providing an overview of key developments and issues regarding SSA's external debt. It also provided an insightful discussion regarding the economic outlook of the region in light of its external debt characteristics. The discussion began with an overview of external debt profile in SSA and the resulting economic outlook for the region. In this regard, the various developments that have occurred since SSA started accumulating external debt in the 1970s to date, were discussed. The chapter also discussed the various efforts of international financial institutions and other stakeholders towards ameliorating the region's external debt burden through various initiatives, as well as the effects of

such initiatives. Furthermore, the chapter elaborated upon different aspects of SSA's external debt. The first of these was a discussion of the evolution and trend of external debt in the region, which detailed how the region started embracing external debt as a means of bridging their finance gaps before falling into a cycle of unsustainable debt. The impact of the various interventions by the international financial institutions was reflected upon, as was the trend of external debt in the region over the years. Next was a discussion on the structure of external debt stock of SSA, which shows that over time, long-term debt has remained a dominant component of SSA's external debt stock, constituting about 79% of the total external debt stock on the average between 1980 and 2015. In the last section, we reflected on the severity of the burden of external debt in SSA by analysing the region's debt ratios. We found that despite an appreciable decline in SSA's debt burden over the years, thanks to several debt relief schemes, the debt burden for the region still remains one of the highest in recent times among the developing regions of the world.

Chapter 3 presented both the theoretical and empirical literatures for the study. The first section discussed the theoretical literature by elaborating upon different theories of growth and debt, as well as their respective positions on the relationship between the two macroeconomic variables. The first growth theory discussed was the classical growth theory where the views of foremost classical economists like Adam Smith, David Ricardo and J. S. Mill on debt-growth nexus were laid bare and assessed. This was followed by a review of the Harrod-Dormar growth model which was found to hold similar views to those of the classical economists, except that it employed the Keynes' short-run analysis in addressing long-run problems, commonly described as a classical-Keynesian model of economic growth. The section also reviewed the neoclassical growth theory, which has been principally attributed to the Solow (1956) and Swan (1956) models. In addition, the contributions of other notable neoclassical economists, such as Blanchard (1985), Diamond (1965), Modigliani (1961) and Vickery (1961) were also discussed, thereby providing the different facets of the neoclassical views on economic growth and debt.

The theory of endogenous growth theory was discussed too, starting from the originative works of Lucas (1988) and Romer (1986) which attribute growth in an economy to endogenous forces such as savings, and investments in human capital as well as research and development, rather than to exogenous forces (Lucas, 1988:40; Mattana, 2004:84). Different aspects of the theory were also assessed in order to introduce a robust discussion on the topic. In this regard, the different versions

of the theory discussed included the AK model (Frankel, 1962:997; Romer, 1986:1035), the innovation-based endogenous growth theory (Romer, 1990:71), and the Schumpeterian theory (Grossman & Helpman, 1991:35).

Next was a discussion on the Keynesian theory which was predicated on the Keynes' seminal publication (Keynes, 1936) and which directly opposed the classical growth theory. Furthermore, the debt overhang hypothesis, based on the works of Krugman (1988) and Myers (1977) was assessed and juxtaposed with the earlier mentioned theories of growth. The last theory examined in the section was the debt Laffer curve introduced by Sachs (1989). In addition to assessing this theory, its application to the claim of a nonlinear relationship between debt and economic growth in empirical literature was also brought to light. Overall, the study appraised the highlighted theories and discussed the lessons engendered by them. Furthermore, the theoretical literature reviewed provided the rational framework for a review of empirical literature for the study and also laid the foundation for the methodology.

The second section of the chapter focused on a review of empirical literature. The empirical literature was divided into five different categories for discussion based on the different aspects of the study that each addressed. The first sub-section reviewed empirical studies on the linear relationship between debt and economic growth, with many studies concluding that an increase in debt impacts economic growth negatively and vice-versa, while very few studies arrived at the opposite conclusion. The section also deliberated on empirical studies that investigated the existence or otherwise of a nonlinear relationship between debt and growth, with most of them concluding that the relationship follows a nonlinear pattern (for example, Caner *et al.,* 2010:5; Checherita-Westphal & Rother, 2012:1396; Drine & Nabi, 2010:493; Kumar & Woo, 2010:16; Pattillo *et al.,* 2002:19, 2011:15; Reinhart & Rogoff, 2010:573). The sub-section also examined a few dissenting findings of little or no evidence of nonlinear relationship between debt and growth (for example, Eberhardt & Presbitero, 2015:8; Herndon *et al.*, 2014:271; Kourtellos *et al.*, 2013:35; Presbitero, 2010:9; Schclarek, 2004:8; Schclarek & Ramon-Ballester, 2005:12), thereby reflecting a case of inconclusiveness on that aspect of the study.

The third category of empirical literature reviewed the empirical studies dealing with the channels of transmission between debt and economic growth. Although previous studies in this category of

literature are sparse, most of them identify investment as a channel of transmission, but their results are inconsistent with one another as regards other potential channels such as total factor productivity, physical capital accumulation, savings and interest rate. Empirical studies on the relationship between institutional quality and economic growth were discussed too, with most studies asserting that more improved institutions are associated with higher economic growth. The last category of empirical literature in this section addressed the role of institutions in the relationship between debt and growth. Most of the studies reviewed asserted that the quality of institutions plays a pivotal role in determining the nature of impact that debt exerts on economic growth. However, the studies were generally silent on the minimum level of institutional quality that should be attained for debt to enhance growth. Overall, each of the sub-sections involved a review of multi-country studies, capturing both developed and developing countries, with special emphasis on studies focusing on SSA countries.

Chapter 4 describes the methodology of the study. This includes a description of the theoretical framework, which involved a discussion of the neoclassical growth theory, with specific attention to the Cobb-Douglas production function as inspired by the literature (Demetriades & Law, 2006:24; Lau, 2015:98; Qayyum & Haider, 2012:104). This was followed by a specification of the models to be estimated in line with the theoretical framework and the respective empirical objectives. The chapter also provided information about the overall research design for the study, as well as the description, measurement, sources and the justification for the selection of all dependent and explanatory variables included in all the models. Besides the above, a set of descriptive and statistical tests used to determine the statistical properties of the variables were also described. The tests included descriptive statistics, correlation analysis and panel unit root tests. For the panel unit root tests, as suggested by the literature, discussions were made on the Im *et al.*, (2003) test; Levin *et al.*, (2002) test; and the ADF-type test (Maddala & Wu, 1999). The last section provided a comprehensive discussion on the panel ARDL estimation technique of Pesaran and Smith (1995) and Pesaran *et al.* (1999) used to address the empirical objectives of the study.

In Chapter 5, results from all the regressions conducted on all the models in the study were presented and discussed. First was the trend analysis of the three main variables in the study, that is: economic growth, external debt and institutional quality, as well as results of the statistical and descriptive tests conducted on all the data sets. Of particular interest were the results of the panel

unit root tests which showed that all the variables in the models were integrated of either order one or order two, thereby lending credence to the choice of the panel ARDL estimation technique for the analysis. Furthermore, the Chapter reported and discussed the results of all the models estimated in order to achieve the empirical objectives of the study.

Results from the panel ARDL regression for investigating the nonlinear effect of external debt on economic growth in SSA was first one reported on. The long-run PMG estimates showed that external debt exerted a nonlinear impact on economic growth in SSA over the study period. In particular, the relationship between the two variables was found to be inverted U-shaped, which indicates that external debt stock at moderate levels enhances economic growth before reaching a threshold, beyond which it begins to depress economic growth. This threshold was estimated at 43% of GNI, indicating that external debt drives economic growth in the long run when it falls below the threshold, but becomes deleterious to it as soon as the threshold is exceeded. Furthermore, estimates of the other explanatory variables show that all the variables have a positive impact on economic growth in the long run. In other words, it was found that higher levels of institutional quality, investment and human capital are associated higher economic growth, and vice-versa. The model's error correction term was found to be negative, less than one and statistically significant, indicating that there is indeed a long-run relationship among the variables, and that any previous disequilibrium in the system would be corrected in the current period. Lastly, the short run estimates demonstrated that external debt had no impact on economic growth in the short run, which is also true for institutional quality and investment. However, human capital was found to have a positive effect on economic growth in the short run.

Additionally, estimates of the robustness checks conducted on the models were also reported. For this purpose, three different models were estimated with each using different measures of external debt to assess the sensitivity of the PMG results to different proxies of external debt. The three models employed the external debt/export ratio, the interest payment on external debt/export ratio and the total external debt stocks, in their respective estimations. Both the long-run and short-run results of the three models support the findings in the main regression. Specifically, they all reported a nonlinear effect of external debt on economic growth in the long run, as well as a inverted U-shaped relationship between the two variables, with the threshold beyond which external debt becomes deleterious to economic growth estimated at 306% of export, 34% of export

and $5.1billion for models with external debt/export ratio, interest payment on external debt/export ratio and total external debt stock, respectively. The ECT in each of the models was also found to be negative, less than one and significant at 1% significance level. Overall, results of the consistency tests conducted showed that the results were robust to alternative measures of external debt.

The second set of panel ARDL regressions carried out was aimed at identifying the channels of transmission from external debt to economic growth. Five different potential channels were tested in this regard: private investment, public investment, total factor productivity, savings and interest rate. In each of the models, the dependent variable was the respective channel being investigated, while the main explanatory variables were external debt/GNI ratio and its squared term. Different regressors were also included in each model as control variables. Results from the models affirmed private investment, public investment and total factor productivity as the channels through which the nonlinear effect of external debt is transmitted to economic growth. While the results of the first two variables were found to be robust as regards alternative measures of external debt, those of total factor productivity were not found to be robust. Furthermore, the PMG estimates confirmed that interest rate was a channel transmitting linear and positive effects from external debt to economic growth, while they suggested that savings is not a channel of transmission between the two variables.

The last set of models were estimated to investigate the role of institutional quality in the relationship between external debt and economic growth. Results from the various regressions indicated that while external debt exerts a negative effect on economic growth, institutional quality mitigates the adverse effect in countries with good institutions. Furthermore, the minimum level of institutional quality beyond which external debt becomes beneficial to economic growth was estimated at 5.1/10. Sensitivity analysis was also conducted on the results of the model, which confirmed that the results were robust to alternative measures of institutional quality.

Chapter 6 provides the summary, conclusions and recommendations of this study. The chapter presents the synopsis of the entire study in an explicit and concise fashion. Furthermore, this chapter presents the implications and recommendations for research and policy derived from the study. In addition, the chapter sheds light on the limitations of the study, as well as opportunities

for further research on the subject. This chapter also highlights how each of the objectives of the study as articulated in Chapter 1 has been addressed and achieved. Finally, the important contributions of the thesis regarding the subject under consideration are also outlined.

6.3 REALISATION OF OBJECTIVES OF THE STUDY

This section gives an account of how the various objectives of the study were achieved. As pointed out in Chapter 1, the objectives of the study were classified in three: primary, theoretical and empirical. The primary objective of the study was to examine the relationship between external debt, institutional quality and economic growth in SSA countries. In order to address this objective in a comprehensive manner, it was further sub-divided into theoretical and empirical objectives.

As stated in chapter 1 and above, this study set out to achieve three theoretical objectives. The first theoretical objective was to describe and assess the underlying thoughts on debt-growth nexus from theories of debt and economic growth. This objective was achieved in Chapter 3 of the study where some theories of growth and debt were discussed and analysed. The theories include the classical, Harrod-Dormar, neoclassical, Keynesian and endogenous growth theories. Additionally, the debt overhang hypothesis and debt Laffer curve were discussed. From their respective standpoints, these theories elucidated the relevance or otherwise of debt in the process of economic growth and development, as well as the nature of the impacts it exerts on the economy.

The second theoretical objective was to describe and assess developments and issues surrounding external debt in SSA. This objective was achieved in Chapter 2 of this study, where many issues associated with external debt in developing countries, and particularly in SSA were discussed. The issues include an overview of external debt profile of SSA and the consequent economic outlook for the region, various efforts of international financial institutions and other stakeholders towards ameliorating the region's external debt burden through various initiatives, as well as the effects of such initiatives. In addition, different dimensions of SSA's external debt, such as evolution and trend, structure, as well as the severity of the burden of external debt in SSA were addressed. All these discussions helped to shed light on the various developments and issues associated with external debt in SSA over the years.

The third theoretical objective focused on a review of existing empirical literature on the relationship between external debt, institutional quality and economic growth. This objective was achieved in Chapter 3 of this study, where empirical literature was assessed under different scopes associated with the relationship between the three variables. This included empirical studies on the linear and nonlinear relationships between external debt and economic growth, channels of transmission between external debt and economic growth, the relationship between institutional quality and economic growth and the role of institutional quality in external debt-economic growth nexus. The literature reviewed on each of the areas included studies on both developed and developing countries, with particular emphasis on SSA countries.

Turning to the empirical objectives, the study set out to achieve three empirical objectives as stated in Chapter 1. The first empirical objective was to investigate the nonlinear effect of external debt on economic growth in SSA countries. This objective was achieved in Chapter 5, through the estimation of panel ARDL models. The models were able to demonstrate that external debt exerts a nonlinear impact on economic growth in SSA countries. Moreover, the models indicated the threshold of external debt beyond which it becomes deleterious to economic growth. Estimates from the sensitivity analysis conducted also confirmed that the results obtained from the analysis were robust to alternative measures of external debt.

The second empirical objective was concerned with identification of channels of transmission in the relationship between external debt and economic growth in SSA countries. This objective was also achieved in Chapter 5, with the estimation of panel ARDL models, in which case a model was estimated to test whether each of the potential channels suggested by the literature was indeed a channel of transmission for SSA countries. The results indicated that private investment, public investment and total factor productivity constituted channels for the transmission of nonlinear effect of external debt to economic growth. On the other hand, the estimates suggested that in the relationship between external debt and economic growth, interest rate was a channel of transmitting a linear effect, while savings is not a channel of transmission. In addition, except for the total factor productivity model, the results of all the remaining models were found to be robust to alternative proxies of external debt, based on the estimates of the consistency tests conducted.

The third empirical objective was to investigate the role of institutional quality in the relationship between external debt and economic growth in SSA countries. This objective was also realized in Chapter 5, through the estimation of panel ARDL models that included interaction terms of external debt and institutional quality variables. The models revealed that while external debt has a negative impact on economic growth, institutional quality is able to mitigate this negative effect. Additionally, a minimum level of institutional quality that SSA countries need to attain if their stock of external debt is to benefit their economies was determined for both the composite index of institutional quality and selected indices of institutional quality. Estimates from the sensitivity analysis conducted also affirmed that the results of the panel ARDL models conducted were robust to alternative proxies of institutional quality.

6.4 OVERALL POLICY IMPLICATIONS

This section presents some policy implications of the findings of this thesis. The policy implications emanated from the results of the models estimated in pursuit of the objectives of the study. Moreover, some of the policy implications also emerged from the reviewed literature.

6.4.1 Policy implications emanating from the nonlinear effect of external debt on economic growth

The study found that external debt has a nonlinear effect on economic growth in SSA, in which case external debt at moderate levels enhances growth, while external debt at high levels depresses growth. Furthermore, the threshold of external debt beyond which it becomes deleterious to economic growth was computed at 43% of GNI, 306% of export, US$5.1billion and 34% of export for external debt interest payment. A clear policy implication of this is that governments of SSA countries should drastically reduce their reliance on external debt in their quest for development. This would go a long way in ensuring that their external debt stocks fall below the optimal threshold beyond which external debt hampers economic growth in the region. Instead, they are advised to galvanise their domestically generated revenue collection process in order to enhance revenue generation that would enable them to bridge the gap between the available resources and expenditure with minimal resort to external debt.

One major way of achieving this is by devising creative strategies for deepening their tax base and reforming their tax system in such a way that the relatively high levels of tax evasion and avoidance in several countries in the region would be reduced to a barest minimum, in order to raise government revenue generation. Most SSA countries have a disproportionately large number of businesses in the informal sector, the bulk of which are not adequately captured in the tax pool. Such entities should be strategically integrated into the tax system so as to deepen the tax base as they form a critical mass that can potentially improve government revenue. Further, the huge recurrent expenditure and cost of governance being borne by most of these governments should be reduced in favour of capital expenditure for sustainable development.

Furthermore, it is noteworthy that a policy implication of the finding as regards the existence of thresholds of external debt beyond which it hampers growth does not necessarily connote that fiscal authorities should pursue an objective of steadying their external debt stocks at these threshold levels. Since the authorities might not know when a major economic shock could strike, especially as most of the economies in the region are susceptible to different shocks from the international commodity market, it is recommended that they target external debt levels well below these thresholds. An important policy implication of this is that fiscal authorities in SSA should include debt-targeting policies and rules in their debt management framework in order to attain solvency and improve their public finance systems.

An important policy implication of the negative effect of high levels of accumulated external debt on economic growth is that governments of SSA countries should start adopting a pragmatic approach towards reducing their external debt burden, by way of efficient use of the already accumulated debt. They must take practical steps towards total eradication of misallocation and squandering of the borrowed funds. Moreover, the funds must be directed towards addressing many priority areas such as human capital development, poverty eradication, bridging infrastructural deficits, galvanising production and other endeavours that promote the welfare and development of the economy. Doing this would stimulate inclusive growth in the economy, and over time eliminate the burden of external debt currently holding sway in the region.

Another policy implication from the finding is that an export-led growth strategy for improved balance of payments should be devised in SSA economies. This is in view of the fact that foreign

exchange earnings play a crucial role in meeting external debt obligations. Hence, accumulated external debt should be channelled towards galvanising the real sector of the economy. Furthermore, foreign direct investment with a focus on industrialisation of the economy should be consciously attracted into the economies in order to boost their export capabilities. In addition, to achieve this, there must be conscious efforts towards ensuring that a large portion of private sector's long-term external debt stock is held in the manufacturing industry in order to enhance their productive capacities and international competitiveness. With such export promotion economic strategies, foreign exchange inflow can be enhanced, thereby reducing some of the difficulties that these countries usually encounter when their debt obligations are due.

Moreover, in view of the fact that exports enhance liquidity and solvency, while import, of consumption items in particular, generally hamper liquidity and solvency, the study recommends that SSA countries should put in place deliberate policies that would compel import of more capital and intermediate goods and less of consumption goods. This would enable the countries to gradually move away from predominant export of primary goods and its many issues towards production and export of finished goods, which would earn the countries the much needed foreign exchange.

What is more, in view of the negative effect of high and accumulated external debt on the economies of SSA, it is recommended that these countries should rely more on foreign aids rather than on foreign debt, in line with Qayyum *et al*. (2012:17) who posits that foreign aid affects economic growth positively. In order to achieve this, SSA countries should carefully position themselves in a way that would enable them to attract foreign aids. They need to gain the confidence of the international community through transparency in governance and through proper accountability as regards the grants and aids they currently enjoy. Moreover, accurate socio-economic and demographic data must be kept and made accessible in order to make for easy decisions on the part of foreign aid givers.

In addition, lending institutions and countries, as well as all stakeholders in international debt management and debt relief initiatives are advised to always orient the various debt-relief policies and initiatives towards the individual characteristics of the debtor countries. This will enable them

to award such packages to deserving countries, in line with the overall debt sustainability of individual debtor countries.

6.4.2 Policy implications emanating from channels of transmission

This study found that private investment constitutes a channel of transmission from external debt to economic growth. Moreover, it was also found that private investment suffers a crowding-out effect from public investment. Therefore, a policy implication arising from the susceptibility of private investment to negative impact from external debt and public investment is that government authorities should formulate deliberate monetary and fiscal policies to counteract these negative effects. Monetary authorities should endeavour to stimulate private investment by improving access to funds. This can be achieved through a strategically downward review of interest rates in the economy. As it stands, commercial bank lending rates in SSA are some of the highest in the world, with Madagascar's rates being as high as 60% and the majority of others providing credit facilities at double-digit rates (World Bank, 2018). The fiscal authorities can also stimulate private investment through provision of investment stimulants such as subsidies, tax holidays and so forth, to selected private sector businesses that are facing stiff competition from the international market.

Furthermore, results from the study indicate that external debt exerts its negative impact on economic growth not just through the channels of private investment, but also through public investment. In view of this, the study recommends that external debt stocks of SSA countries should be reduced in such a way that its reduction would engender improvement in investment because the implication of these results is that huge stocks of accumulated external debt has a crowding-out effect on investment. Other sources of funding their expenditure such as increase of domestically generated revenue, attraction of more foreign aids, and so on, should be explored, while at the same time, the huge recurrent expenditure being shouldered by the SSA governments should be drastically reduced. Moreover, as a way of easing the liquidity constraints which crowds out investment as a result of external debt servicing, the study recommends setting of and adherence to external debt service thresholds in order to provide funds for investment activities.

Total factor productivity was also identified by the study as a channel of transmission from external debt to economic growth. A policy implication of this is that in order to mitigate the negative impact of external debt on total factor productivity, even as economic uncertainties created by

external debt accumulation and burden disincentivise technological improvement, governments of SSA countries must recognise the need for advanced technology and make deliberate policies and investments that are consistent towards achieving it. Increased attention and funding should be provided for science, mathematics, technology and engineering education, while academic exchange programmes in those fields should be facilitated with institutions in industrialized countries. Production efficiency is another component of total factor productivity that this study recommends for improvement. In collaboration with the private sector, the government should emphasise investment in human capital development, massive acquisition of productive equipment and international best-practice corporate governance and managerial processes in order to move the economies' production possibility frontier outward and enhance their industrial potential.

6.4.3 Policy implications arising from the role of institutional quality in the external debt-economic growth nexus

Based on the estimates from the models investigating the role of institutional quality in the external debt-economic growth nexus, the study found that good institutions alleviate the negative effect of external debt on economic growth. An obvious policy implication of this finding is that SSA countries should consciously pursue rapid improvements in their governance infrastructure (economic, legal and political). The descriptive statistics of the data confirm that SSA countries have very low scores in each of the components of institutional quality and governance, as provided by ICRG and WGI. The quality of institutions and governance in most SSA countries is alarmingly low and it constitutes a significant obstacle that often constrains various efforts made apropos economic reforms and sustainable development. Hence, special attention must be paid to issues of corruption, bureaucratic difficulties, policy somersaults, government instability, poor maintenance of law and order, poor democratic accountability and the frighteningly poor quality of governance. Without resolving these problems, government efforts towards maintaining optimal debt stock that would promote economic growth and stability would be thwarted by these institutional factors. Furthermore, tackling these issues would help in improving investors' confidence and creating an environment conducive to attracting the much-needed investment for industrial growth. It would also improve the inflow of foreign aid into the region, as good governance and demonstrated accountability are among the most important qualities considered by international donor agencies.

Furthermore, given the need for SSA countries to improve the institutional quality, the study recommends that any future debt-relief or debt-forgiveness schemes should entail stringent guidelines on required level of institutional reforms and quality from any applicants for such initiatives. To this end, international donor agencies and countries are enjoined to accord substantial value to good institutions and governance in their selection procedures by rewarding quality improvements in the said governance and institutional reforms, to applicant countries. It is hoped that this would help to improve the overall quality of institutions in SSA as it would provide a clear signal to the governments of these countries and incentivise them to improve their governance infrastructure(s). Specifically, the donor agencies and countries can adopt a policy design that predicates the amount of debt forgiveness or debt relief that a country can receive on verifiable improvements in governance infrastructure and institutional quality, as suggested in the literature (Arnone *et al.*, 2008:32; Collier, 2007:36; Freytag & Pehnelt, 2008:77; Ouedraogo, 2015:124; Presbitero, 2008:20).

Another important policy implication of the results is that credit-issuing institutions and countries should ensure adherence to measures that improve the overall governance infrastructure a precondition to securing credit facilities by countries expressing interest in taking up such facilities. This measure would surely shift their focus towards improving the quality of institutions in the countries, while at the same time reducing external debt accumulation in the region, as countries that fail to meet the criterion are refused such facilities.

6.4.4 Other general policy implications

There is a need for SSA countries to overhaul their overall macroeconomic policy environments. This is to ensure that efforts made towards rejigging their external debt profile are not restricted by other contradictory macroeconomic policy stances. Efforts must be made to ensure their monetary and fiscal policies are in line with the external debt management objectives and endeavours. Authorities in SSA are also most strongly urged to prioritise instituting effective debt monitoring teams that would be charged with the responsibility of making sure their external debt levels are restrained within a specified manageable level. For this, each country might have to set a country-specific threshold that should be determined upon taking into consideration its peculiar economic characteristics.

In all the models where population growth rate was included as a regressor, it was found that it exerts a negative influence on economic growth. A thorough examination of the data sets for the two variables disclosed that the populations of most SSA countries are growing at faster rates compared with the growth rate of their respective economies. This issue calls for concern and requires concerted efforts by all and sundry towards aligning the demography of the countries with their economic realities and aspirations. The structure of the population should be considered in formulating macroeconomic policies and migration regulations in order to turn the population level and structure into an ancillary to growth, rather than an impediment to growth.

Further, the policy implication of the negative impact that external debt has been reported in this study to exert on investment is that savings should be mobilised in SSA countries as a way of galvanising investment. According to the Harrod-Domar growth model, increased savings leads to increased investment, which in turn enhances the economy's capital stock, the result of which is higher growth in the economy. The monetary and fiscal authorities in SSA are therefore advised to devise strategies and policies that would substantially increase savings in the economies without hampering consumption to the extent that the level of aggregate demand needed for the economy to attain full employment is not compromised. Savings mobilisation can actually become a very useful tool for driving investment in SSA given the claim in the study that savings is not a channel through which external debt transmits negative effect to economic growth.

Lastly, the study recommends that efficient exchange rate management strategies should be put in place in order for the aforementioned policy recommendations to yield intended results.

6.5 CONTRIBUTIONS OF THE STUDY TO THE EXISTING LITERATURE

The study has made some important contributions to the literature on the relationship between external debt, institutional quality and economic growth. Firstly, the study was able to definitely show that external debt exerts a nonlinear impact on economic growth in SSA. Thus, the study demonstrated that external debt at moderate levels enhances economic growth, while it becomes deleterious to economic growth at high levels that are beyond a particular threshold. This contribution becomes important as it serves to caution SSA governments from indiscriminate and unbridled accumulation of external debt, particularly, given the paucity of studies examining the nonlinear effect of external debt on economic growth in SSA as a whole. Moreover, the study

makes an addition to the literature, as the few previous studies on SSA have public debt as their focus, while others that examine external debt in SSA countries only conducted their studies on a minor section of the region (for example, Ajayi & Oke, 2012; Ouedraogo, 2015).

Secondly, the study indicated the threshold of external debt beyond which it begins to hamper economic growth. Specifically, the study employed four different measures of external debt and computed the external debt threshold based on each of these proxies. For external debt/GNI and external debt/export ratios, the external debt threshold was estimated at 43% of GNI and 306% of export, respectively. For interest payment on external debt as a percentage of export, it was estimated at 34% of export, while it was computed at US$5.1billion for total external debt stocks. According to the study, economic growth would begin to experience a slow down at any external debt level beyond any of these turning points. This contribution becomes important, as it could aid the authorities in formulating debt-targeting policies and, to the best of this researcher's knowledge, no known previous study has made this specific contribution to the body of knowledge on SSA. The contribution in this regard by Ouedraogo (2015) focused on only few of the West African countries, while that of Lopes da Veiga *et al.* (2014) focused on total public debt.

Thirdly, the study identified the channels of transmission from external debt to economic growth. In particular, private investment, public investment and total factor productivity were established as the channels through which nonlinear impacts of external debt are transmitted to growth. On the other hand, interest rate was established as a channel for transmitting linear effect to economic growth, while it was found that savings does not constitute a channel of transmission. These results add to the existing works on the channels of transmitting external debt effect to economic growth, as there exists only a handful of studies that have examined the channels of transmission from public debt or external debt to economic growth, and none of the very limited number of studies was carried out on SSA countries.

Fourthly, the study contributes to the literature by employing an interaction variable of external debt and institutional quality within a panel ARDL framework to establish that improvement in institutional quality serves to alleviate the adverse effect of external debt on economic growth in SSA. To the best of this researcher's knowledge, no previous study has examined the role of institutions in external debt-economic growth nexus using an interaction variable. Most of the

previous studies did so by merely including an institutional quality variable as a regressor in the model. Furthermore, as mentioned before, most such previous studies did not specifically consider SSA countries.

Fifthly, the study adds an important dimension of results to the literature by determining the threshold of institutional quality that SSA countries need to attain in order for external debt to benefit their economies based on the different proxies of institutional quality employed in the study. For the composite institutional quality index based on the ICRG data set, a minimum level of 5.1/10 needs to be attained by SSA countries. For law and order, corruption index and government stability, the minimum level of institutional quality needed to attain were determined as 2.9/6, 3.3/6 and 11.6/12, respectively. On the other hand, for the composite index of institutional quality based on the WGI data set, a minimum level of 1.3/2.5 needs to be attained by SSA countries, while for selected governance variables, they need to attain 0.7/2.5, 1.1/2.5 and 1.05/2.5 levels for regulatory quality, corruption control and government effectiveness, respectively. This finding is an important contribution to literature, as no previous study has determined such institutional thresholds for external debt-economic growth nexus. The closest to it was Daud and Podivinsky (2014:1182) who estimated economic freedom threshold in public debt-economic growth relation for Malaysia.

In addition, this study contributes to the literature from the perspective of estimation technique. Most previous panel studies on debt-institutional quality-economic growth nexus employed such econometric methods as fixed effects, pooled OLS, the error correction model and GMM. This study adds to the discussion of the issue under consideration by employing the panel ARDL technique, proposed by Pesaran and Smith (1995) and Pesaran *et al*. (1999). Furthermore, the study also makes an important contribution by employing different data sets and models to verify the robustness or otherwise of all estimates while investigating each of the empirical objectives of the study. The consistency of the results from the various models examining each objective reflects the robustness of their respective estimates.

Lastly, the various policy recommendations put forward in this study would reinforce the overall external debt management framework, as well as the institutional and governance infrastructure that oversee the process. The policy implications would also address the various issues that have

been identified in the study to be hamstringing the efforts of the monetary and fiscal authorities in their efforts to transform their respective economies through the funds sourced from external debt.

6.6 LIMITATION OF THE STUDY

The main challenge encountered in the course of undertaking this study was the difficulty in accessing certain data sets to capture the institutional quality variable. While the data sets for all institutional quality variables employed in this study were sourced from the ICRG database and WGI. Institutional data sets from other reliable sources such as Business International (BI) and Governance Indicators ('KKZ indicators') could not be employed because of financial constraint. The implication of this was that the study could not capture some other institutional variables such as property rights, economic freedom, graft, violence, civil liberty, and regulation of credit, labour and business.

6.7 OPPORTUNITIES FOR FURTHER RESEARCH

The subject of relationship between external debt, institutional quality and economic growth is a very broad subject that can be investigated from many different aspects for meaningful contribution to the body of literature and policy formulation. To this end, the study suggests that the following aspects be considered by future research endeavours. First, future research for SSA could disaggregate external debt into its public sector and private sector components in order to evaluate the relative effect of each component on economic growth in SSA. This is because it is imperative to compare the performance of foreign loans in the two sectors in order to determine which of the two components is put to more efficient use in the economy, as this would aid the formulation of well-informed and reformative policy decisions in debt management process.

Second, future studies could assess external debt management strategies from the standpoint of debt management objectives of reducing cost of borrowing and debt sustainability. The overall framework of the strategies from the viewpoint of institutional infrastructure can also be further evaluated. Third, more can be learned about the subject in SSA if future research focuses on time series analysis for individual SSA countries, especially in a comparative study, as this would ensure that their respective heterogeneous features and experiences are properly accounted for.

This would also enable the determination of country-specific external debt and institutional quality thresholds for each SSA country.

Fourth, future research could employ data sets from other reliable sources such as Business international (BI) and Governance Indicators ('KKZ indicators') in the growth models. This would enable evaluation of institutional quality based on other indices such as civil liberty, property rights and economic freedom, which we could not use in this study due to unavailability of data. Moreover, future studies could provide regular update on the subject with the use of latest data sets and more appropriate estimation techniques.

6.8 FINAL REMARKS

This study investigated the relationship between external debt, institutional quality and economic growth in SSA countries. The study estimated various panel econometric models within the framework of panel ARDL in an attempt to achieve its empirical objectives. Results from the study lend credence to the position of other authors who have suggested that the relationship between external debt and economic growth follows a nonlinear pattern. Further, the study suggests the threshold of external debt beyond which it becomes deleterious to economic growth. The channels through which the effects of external debt are transmitted to economic growth were also identified in the study. Moreover, the role of institutional quality in external debt-economic growth nexus and the threshold of institutional quality that SSA countries need to attain for external debt to benefit the economy were also determined in the study. These results have many policy implications, which have already been highlighted in the thesis. Notwithstanding, the study advocates further researches on the subject, especially on areas mentioned in the section immediately above of this chapter. Finally, the author will be pleased if the findings of this study become a catalyst for thought-provoking and policy-oriented debate on the subject.

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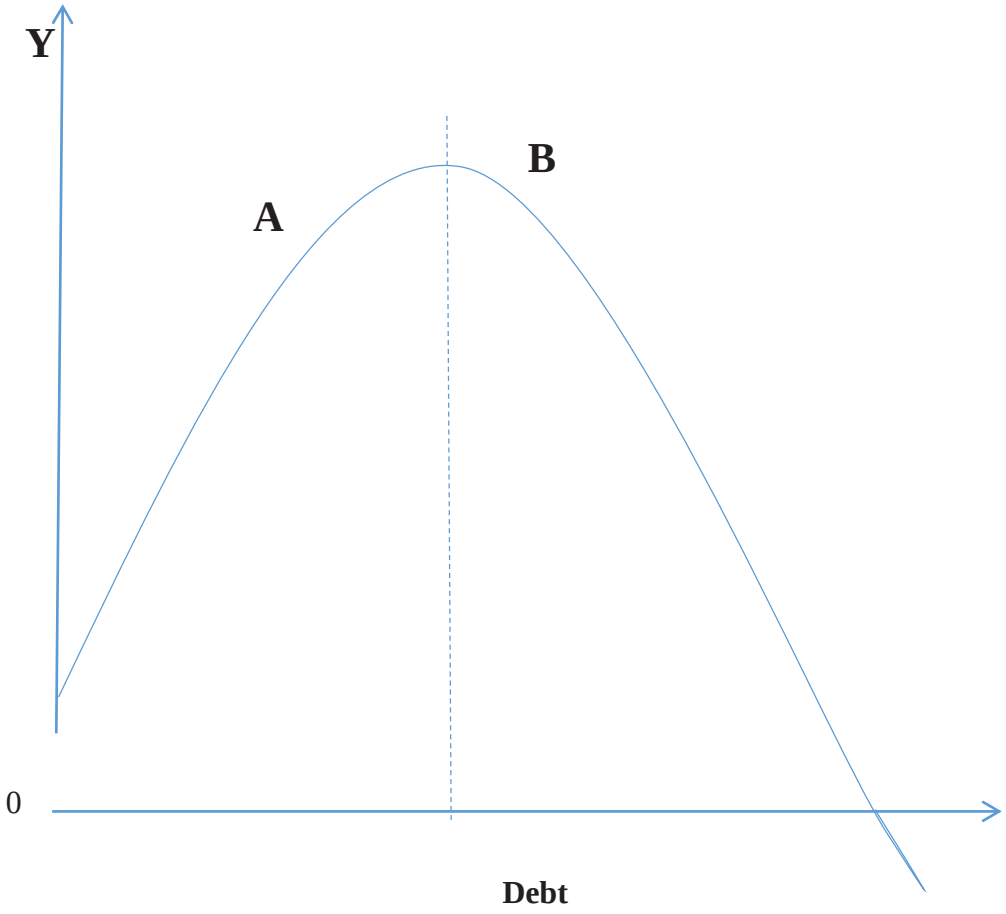
APPENDIX 1: THE DEBT LAFFER CURVE



APPENDIX 2: LIST OF COUNTRIES

Angola	Ghana	Nigeria
Botswana	Guinea	Senegal
Burkina Faso	Guinea-Bissau	Sierra-Leone
Cameroon	Kenya	South Africa
Congo, Democratic Republic	Liberia	Sudan
Congo Republic	Madagascar	Tanzania
Cote d'Ivoire	Malawi	Togo
Ethiopia	Mali	Uganda
Gabon	Mozambique	Zambia
Gambia	Niger	Zimbabwe

APPENDIX 3. DEFINITION OF INSTITUTIONAL VARIABLES

1. **Government stability (12 points)**

   This is an assessment of the government's ability to carry out its declared program(s), and its ability to stay in office. The risk rating assigned is the sum of three subcomponents, namely government unity, legislative strength and popular support, each with a maximum score of four points and a minimum score of zero points. A score of four points indicate very low risk, while a score of zero points indicates very high risk.

2. **Investment profile (12 points)**

   This is an assessment of factors affecting the risk to investment that are not covered by other political, economic and financial risk components. The risk rating assigned is the sum of three subcomponents, each with a maximum score of four points and a minimum score of zero points. A score of four points indicate very low risk, while a score of zero points indicates very high risk. The subcomponents are contract viability, profit repatriation and payment delays.

3. **Corruption (6 points)**

   This is an assessment of corruption within the political system. This measure of corruption is more concerned with actual or potential corruption in the form of excessive patronage, nepotism, job reservations, 'favour-for-favours', secret party funding, and suspiciously close ties between politics and business.

4. **Law and order (6 points)**

   "Law and Order" form a single component, but its two elements are assessed separately, with each element being scored from zero to three points. To assess the "Law" element, the strength and impartiality of the legal system are considered, while the "Order" element is an assessment of popular observance of the law. Thus, a country can enjoy a high rating -3- in terms of its judicial system, but a low rating -1- if it suffers from a very high crime rate if the law is routinely ignored without effective sanction.

5. **Democratic accountability (6 points|)**

   This is a measure of how responsive government is to its people, on the basis that the less responsive it is, the more likely it is that the government will fall, peacefully in a democratic society, but possibly violently in a non-democratic one. The points in this component are awarded on the basis of the type of governance enjoyed by the country in question. For this

purpose, the following types of governance have been defined: alternating democracy, dominated democracy, de facto one-party state, de jure one-party state, autarchy. In general, the highest number of risk points (lowest risk) is assigned to alternating democracies while the lowest number of risk points (highest risk) is assigned to autarchies.

6. **Bureaucracy quality (6 points)**

   The institutional strength and quality of the bureaucracy is another shock absorber that tends to minimize revisions of policy when governments change. Therefore, high points are given to countries where the bureaucracy has the strength and expertise to govern without drastic changes in policy or interruptions in government services. On the other hand, countries that lack the cushioning of a strong bureaucracy receive low points because a change in government tends to be traumatic in terms of policy formulation and day-to-day administrative functions.

APPENDIX 4: LETTER FROM THE LANGUAGE EDITOR

CERTIFICATE

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TO WHOM IT MAY CONCERN

This is to certify that I have edited the following document for English style, language usage, logic and consistency; it is the responsibility of the author to accept or reject the suggested changes manually, and interact with the comments in order to finalise the text.

Author: A.S. Hassan

Title: Relationship between external debt, institutional quality and economic growth in sub-Saharan African countries

Document: PhD Thesis Economics

Institution: North West University Vaal Triangle Campus, Vanderbijlpark, South Africa

Sincerely
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2019-11-20

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