Public debt in sub-Saharan African countries: Determinants and economic effects

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By

Princewill U. Okwoche

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Supervisors:

Professor Eftychia Nikolaidou

Dr Christine S. Makanza

Abstract

One of the key macroeconomic policy issues that emerged in the wake of the global financial crisis is the persistent increase in public deficits and debt across the globe. Among researchers and policy makers, this has been the subject of an intense and ongoing debate that mainly seeks to address two issues, namely, the determinants of the growing debt and the economic effects thereof. While most of the debate centres on the advanced and emerging market economies, only a limited number of studies have looked at the case of Sub-Saharan Africa (SSA) countries. This is despite the fact that many countries in the sub-region have been through debt crises in previous decades and are currently facing the imminence of another crisis. This thesis extends the public debt literature by examining the drivers and growth effects of public debt with a focus on SSA countries. The aim is to carry out a more comprehensive analysis of public debt that takes into account the nuances of the sub-region.

The thesis is composed of three distinct but interrelated studies. The first study examines the drivers of public debt while the second study focuses on the growth effects of debt. Both studies employ panel econometric techniques using data for SSA countries. The third study is motivated by recent empirical evidence which shows that the drivers and growth effects of public debt do vary substantially across countries due to unique country-specific factors which may not be properly accounted for in a panel data framework. The study therefore aims to compare country-specific evidence with the evidence obtained from the studies that employ panel data on SSA countries. It focuses on the country case of Nigeria and examines both the determinants and growth effects of public debt. The focus on Nigeria is important due to its position as SSA's most populous and largest economy. Moreover, the country's public debt history is similar to that of most SSA countries. Hence, this study is likely to provide results comparable to studies that utilize panel data for SSA countries.

The first study on the determinants of public debt in SSA contributes to the existing literature in two important ways. First, whereas much of the recent discussions around the topic employ descriptive methods, this study employs formal econometric methods namely, the pooled OLS, fixed effects, and the GMM-type methods of Arellano-Bond and Arellano-Bover/Blundell-Bond. While the fixed effects method helps to deal with unobserved country and time-specific fixed effects, the GMM methods go beyond to account for both the dynamic panel bias and the potential endogeneity in the debt-growth relationship. Overall, the aim of employing a variety of panel estimation techniques is to ensure robustness and facilitate the comparison of the

results. Second and more important, instead of focusing only on the macroeconomic factors as previous studies have done, this study also accounts for the influence of armed conflict, governance quality, and regime-type, which are uniquely important to SSA countries. Empirical analyses are aided by data on 40 SSA countries spanning 1996-2017. The findings confirm the role of economic, socio-political and institutional variables in explaining the growth of public debt in SSA. Specifically, the study provides compelling evidence supporting the debt-reducing roles of economic growth and governance quality, and the debt-inducing role of conflict. Regarding the policy relevance of these findings, we note that there have been some uncertainties around the growth prospects of SSA countries in recent years. Additionally, the incidence of violent conflict has recently increased (Barrett, 2018), coupled with the low quality of governance and institutions prevalent in many SSA countries. The findings therefore, have relevant policy implications that can contribute to the efforts towards debt sustainability in SSA countries.

The second study examines the growth effects of public debt in SSA using an augmented growth model that includes public debt and its squared term to account for the possible presence of a nonlinear effect. Most studies on the effects of debt on growth, particularly following the global financial crisis, have focused mainly on the advanced and emerging countries. Also, most previous studies have assumed that the debt-growth nexus is homogeneous across groups, and that countries are cross-section dependent. This study addresses these issues while focusing on SSA countries. The focus on SSA provides the opportunity to account for the factors that are unique to the sub-region, namely, the quality of institutions and policies, conflict, and adverse terms of trade shocks.

The study employs the fixed effects and system GMM methods under the assumption of homogeneity, and the mean group estimators when assuming that the debt-growth nexus is heterogeneous across countries. It employs a dataset comprising 24 SSA countries spanning 1980-2015. This time period is determined by the data on government gross debt to SSA countries in the Historical Public Debt Database as compiled by Abbas et al. (2011). Mainly, the results strongly affirm the non-linear relationship between public debt and growth, and show that the Debt Laffer curve applies to SSA countries. Furthermore, the results confirm the generally low debt-carrying capacity of SSA countries. A key policy implication of the study is the need for SSA countries to acknowledge their limited capacity to sustain large amounts of debt. Additionally, a comparative analysis of short-term and long-term debt highlights the importance of having a balanced debt structure to aid the management of public debt.

The third study examines the determinants of public debt and its non-linear effects on economic growth in Nigeria. It contributes to the existing literature in three distinct ways. First, in addition to the macroeconomic factors underlying the evolution of public debt in Nigeria, the study accounts for the influence of socio-political factors, including armed conflict and governance quality. To the best of the researcher's knowledge, this would be the first study to take this approach to the debate in the literature focusing on Nigeria. Second, whereas previous studies on Nigeria have mainly employed the external debt component, this study employs the total public debt, as well as the individual components, internal and external debt, for a more comprehensive analysis of Nigeria's public debt. Third, it focuses on the non-linear aspect of the debt-growth nexus which has also been largely ignored in the literature on Nigeria. The study relies on annual time series data sourced from the Central Bank of Nigeria and World Development Indicators spanning 1970-2017. Empirical analyses are carried out using the auto-regressive distributed lag (ARDL) approach to cointegration.

The analyses of the determinants of public debt produced results largely in line with those obtained from the panel study on SSA countries. Economic variables tend to have a strong influence across the regressions. In particular, government's fiscal position, oil price, the real interest rate, and the real exchange rate, are consistently significant across the regressions. Although armed conflict is significant in the external debt model, it turns out that socio-political variables do not play a significant role in the model for Nigeria. Turning to the question of the debt-growth nexus, this study presents compelling evidence of a nonlinear relationship between public debt and growth for the case of Nigeria, similar to the evidence obtained from the panel of SSA countries. There is, albeit, a difference in the nature of the nonlinear relationship. Whereas the panel study presents several threshold estimates that do not reflect the debt-carrying capacity of SSA countries, this study presents a threshold estimate of 56% for total public debt, which does not differ much from the IMF's sustainable threshold of 45% for Nigeria and other lower-middle income countries. Based on these findings, it is important for the government to exercise restraint on spending by ensuring that deficits are created mainly for profitable investments that can yield future streams of income.

Declaration

I, Princewill Okwoche, do hereby declare that this thesis is the result of my own (original) research and has not been previously submitted at this or any other university, either as a whole or in part. All the materials consulted in the course of the study have been duly acknowledged.

Signed by candidate

Signature: ----------

Dedication

To my mother, Alice Oloko Ode

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Above all, I ascribe thanks and praises to the Almighty God who makes all things possible and without whose help I can do nothing.

List of Abbreviations

ADR	Augment Dickey Fuller
AIC	Akaike Information Criterion
AO	Additive Outlier
ARDL	Autoregressive Distributed Lag Model
ARCH	Autoregressive Conditional Heteroscedasticity
CBN	Central Bank of Nigeria
CCE	Common Correlated Effects
CMR	Clemente, Montanes, & Reyes
CPIA	Country Policy and Institutional Assessment
CUSUM	Cumulative Sum
CUSUM SQ	Cumulative Sum of Squares
DMO	Debt Management Office
DSF	Debt Sustainability Framework
ECAs	Export Credit Agencies
ECM	Error Correction Model
GDP	Gross Domestic Product
GFC	Global Financial Crisis
GMM	General Methods of Moments
H-D	Harrod-Domar
HIPC	Heavily Indebted Poor Countries
HPDD	Historical Public Debt Database
ICRG	International Country Risk Guide
IMF	International Monetary Fund
IO	Innovative Outlier
KPSS	Kwiatkowski-Phillips-Schmidt-Shin
LM	Lagrange Multiplier
MENA	Middle East and North Africa
MDRI	Multilateral Debt Relief Initiatives
MG	Mean Group

OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
OPEC	Organisation of the Petroleum Exporting Countries
PCA	Principal Component Analysis
PPP	Purchasing Power Parity
PRIO	Peace Research Institute Oslo
PSTR	Panel Smooth Transition Regression
PVAR	Panel Vector Autoregression
SLM	Sasabuchi-Lind-Mehlum
SSA	Sub-Saharan Africa
TAR	Threshold Autoregression
VAR	Vector Autoregression
UCDP	Uppsala Conflict Data Programme
UNDP	United Nations Development Programme
WDI	World Development Indicators
WGI	World Governance Indicators
WTI	West Texas Intermediate

Table of Contents

List of Tables

List of Figures

Chapter 1

Introduction

1.1 Background of the study

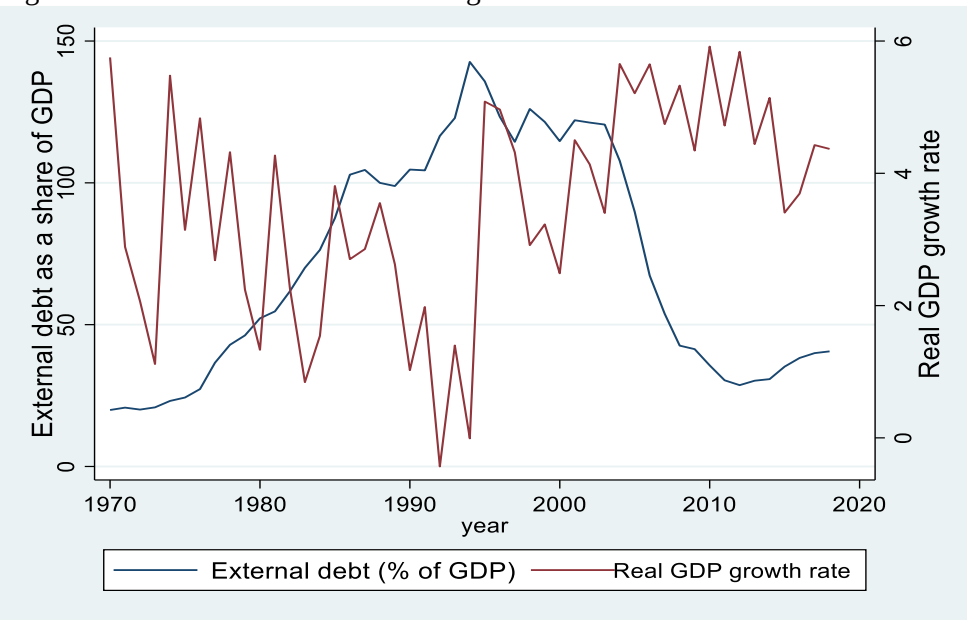
The public debt problem in sub-Saharan Africa (SSA) is one of the sub-region's most recurrent macroeconomic policy issues. The long-drawn debt crisis of the 1980s and 1990s had left a series of devastating economic effects from which many countries in the sub-region are yet to fully recover. SSA's past experience with public debt accumulation gives support to the strand of the literature where high and rising public debt is associated with severe macroeconomic consequences (Bernheim, 1987; Bernheim, 1989; Elmendorf & Mankiw, 1999). It is widely believed that the sub-region's heavy debt burden was the main obstacle to its growth and development in the era of the previous debt crisis (Elbadawi, Ndulu, & Ndung'u, 1997; Pattillo, Poirson, & Ricci, 2002). During that period, there was a massive channelling of the already lean resources into debt service payments (Danso, 1990; George, 1990). This severely affected the development of critical sectors like health, education, and welfare, amongst others. George (1992) notes, for example, that SSA governments made a huge monthly transfer of an average of nearly one billion dollars in debt service payments between 1982 and 1991. This was associated with rampant poverty, low standards of living, and low human development outcomes during the 1980s to mid-1990s.

Relief programmes[1]were launched to deal with the debt problems, to reduce poverty, and to set the pace for growth and development. Although researchers have debated the effectiveness of the debt relief efforts in low-income countries[2], the sharp reduction in debt levels following the relief initiatives, was widely associated with positive economic outcomes. Figure 1-1 presents the trends in external public debt and economic growth from 1970-2018 in 33 SSA countries that benefited from the debt relief initiatives. We observe substantial declines in the debt burden of these countries during the decade of the 2000s. The diagram also depicts marked improvements in economic performance following the interventions, which was accompanied by an improvement in the general macroeconomic environment as well as an increase in demand for commodities (Berg, Berkes, Pattillo, Presbitero, & Yakhshilikov, 2014; Ncube & Brixiová, 2015; IMF, 2018b). These factors led to an improvement, both in credit worthiness

[1] The heavily indebted poor countries (HIPC) program was launched originally in 1996 while the multilateral debt relief initiative was launched in 1999.
[2] See for example, Omotola & Saliu (2009) and Romero-Barrutieta, Bulir, & Rodríguez-Delgado (2015).

and in the fiscal space, which then provided SSA countries with the opportunity to increase public investment spending (Berg et al., 2014; IMF, 2015). As a result, public debt has been on the increase in many of the countries since 2012 (Figure 1-1 depicts this). This has been exacerbated by the impact of the global financial crisis as many countries implemented countercyclical policies.

Figure 1-1. Trends in external debt and growth for 33 debt relief beneficiaries in SSA



Source: Author's compilation using data from World Development Indicators (2020)
Note: Figure 1-1 depicts the trends in average external debt-to-GDP ratio and real GDP growth rate for 33 SSA debt relief beneficiaries. An important observation is the recent downturn in economic growth at a time of rising levels of public debt in this group of countries.

The public debt debate has re-emerged in SSA as in other countries and regions around the world. Critics are particularly concerned about the growing public debt problem in SSA because it signifies the possibility of a new round of public debt crises. The Debt Sustainability Framework (DSF) jointly created by the World Bank and IMF assesses the debt vulnerabilities of low income countries following the debt relief interventions (Barkbu, Beddies, & Le Manchec, 2008; Berg et al., 2014). The framework addresses the salient question of how low-income countries and their donors can balance the conflicting objectives of funding development and avoiding another debt crisis. Debt vulnerabilities are assessed on the basis of a country's debt-carrying capacity which is determined by a variety of factors including the Country Policy and Institutional Assessment (CPIA) rating. Benchmarks of total public debt-to-GDP ratio set at 35%, 55% and 70% are used to categorize countries as weak, medium and strong performers respectively (IMF, 2018a). Many SSA countries have approached or even exceeded their respective thresholds in recent years, based on these benchmarks. In particular,

16 countries are either already in debt distress or are faced with a high risk, while 19 others are facing a low to moderate risk of debt distress (IMF, 2019).

Considering the deleterious economic effects of the previous crisis and the growing tendency in recent years towards its recurrence, researchers have again questioned the possible underlying factors of the public debt problem and the economic effects thereof. To give some perspective to the emerging debt problem in SSA, it is important to recall the identified underlying factors of the previous crisis (Krumm, 1985; Greene, 1989; Danso, 1990; Ezenwe, 1993; Fole, 2003; UNDP, 2016). The three main factors were the commodity price shocks, the easy availability of Eurodollars from the international private capital market, and the unprecedented increase in government expenditure across SSA countries in response to the first two factors. Two other less-emphasised factors were the recession in industrialized countries – which led mainly to the fall in demand for commodity exports of SSA economies, and the rise in global rates of interest.

The commodity price shocks of the 1970s and the 1980s are some of the most notable historical events in African economies. Whereas the commodity boom gave some glimpses of hope for growth and prosperity, such hopes were soon dashed by the sharp declines in commodity prices that set in towards the end of the 1970s and continued well into the 1980s. In the literature that examines the causes of the previous debt crises, these shocks are commonly considered as some of the most important factors (see for example, Greene, 1989; and Danso, 1990). There were unprecedented increases in revenues from the export of commodities such as cocoa, coffee, tea, ground-nut, sugar, and oil in many SSA countries (Krumm, 1985; UNDP, 2016). These increases in revenue formed the basis for a rising trend in government deficits and debt. Many countries were soon faced with the problem of debt sustainability as they were ill-prepared to absorb the wave of adverse commodity price shocks that subsequently hit the sub-region. Moreover, adjustments were delayed due to the downward rigidities in government spending, especially as non-concessional financing was cheaply available to support such delayed adjustments. Rather, the expectations that things would normalize to support the growing and increasingly problematic debt service obligations gave momentum for increased spending.

Another widely featured determinant of the previous crisis is the easy access to credit due to the favourable liquidity conditions in the international financial system. Krum (1985) notes the role of the international financial system in recycling the large OPEC surpluses that resulted from the positive oil shock of the early 1970s. Financial market debt contracts were drawn on non-concessional terms, and thus, involved high rates of interest. The ease of access to this

source of debt finance in SSA resulted in substantial increases in external debt between 1972 and 1979 (Ezenwe, 1993). It is noted that such loans were issued at an average annual rate of 40% for SSA countries in general, and at 32% for oil-exporting countries (Krum, 1985). Clearly, this difference in the interest rate reflects the variation in the perception of risks by international lenders. Not only were these loans characterised by higher rates of interest, they also had shorter maturity and grace periods. Similar to the Eurodollar and international commercial bank lenders, export credit agencies (ECAs) also played a major role in the growth of debt in the sub-region. Export credit facilities were provided at an average annual rate of 32% between 1976 and 1979 (Krum, 1985).

In addition to the foregoing, the previous crisis has also been attributed to the recession in the advanced countries and the large increases in international interest rates (Greene, 1989; Fole, 2003). The global recession that began in the late 1970s and extended into the 1980s led to a fall in the demand for exports, which exacerbated the impact of the adverse commodity shocks. At the same time, global interest rates increased rapidly from low and, sometimes, even negative levels and contributed to the growth of debt in countries with a substantial amount of international bank loans which often carried variable rates of interest. However, given that the larger proportion of debt was held by multilateral institutions (Krumm, 1985), this was a relatively less important cause of the previous debt problem in SSA economies.

Regarding the drivers of the rising debt problem that has re-emerged in recent years, there are two generic factors: the global financial crisis of 2008-2009, and the increased fiscal space created by the debt relief interventions. Apart from these, the problem has also been attributed to the continued weakness in the commodity export markets and to the growing appetite to borrow from the private capital markets[3]. In particular, the non-concessional nature of private market debt tends to worsen the debt service capability of the countries in accordance to what Olabisi & Stein (2015) refer to as the "African premium[4]". Other factors that have also been considered are the declining growth rates, exchange rate depreciations, and rising rate of interest (Ncube & Brixiová, 2015; Mupunga & Ngundu, 2020). It seems interesting that the underlying factors of the previous crisis continue to be relevant today. What is quite notable is the purely economic nature of the factors underlying both the previous and emerging debt

[3] There have been substantial increases in borrowing opportunities as supported by the favorable liquidity conditions in private capital markets and among non-Paris Club lenders.
[4] The authors found that SSA countries borrowed at a higher rate of interest than other countries.

crises. It is, important, therefore, to look for other possible explanations beyond the economic factors.

There is an interesting viewpoint in the analysis of the previous crisis which is relevant to that of the imminent one (Danso, 1990; Ajayi, 1991; Greene, 1989). According to this viewpoint, the underlying causes of public debt can be classified into two categories: internal or external. With the exception of the persistent growth of public deficit spending, all of the other factors discussed above would fall into the category of the external factors[5]. Focusing, perhaps, on the influence of the external factors, researchers such as Ezenwe (1993) argue strongly in support of the need for debt forgiveness or outright default. This argument is supported by the fact that African countries would not be the first to default on their public debt (Reinhart, Rogoff, & Savastano, 2003). George (1992) similarly argues that SSA's debt was relatively small and that an outright default would not pose any threat to the international financial system. On the contrary, Danso (1990) posits that an approach focusing only on the external factors would tend to shift the responsibility of the crisis and thus may not be of much help towards preventing the recurrence of such crises in the future. The study notes the possible influence of the internal factors such as violent conflict and the consequent increase in military spending, economic mismanagement, institutional quality, and population growth in public debt accumulation. Danso's (1990) arguments continue to be relevant in SSA countries considering the persistent problems of ethnic crises, civil wars, terrorist attacks, large scale corruption and low quality of governance *inter alia*.

Similar issues have been raised in the recent and ongoing discussions around Africa's risk of recording another debt crisis. For example, the role of conflict has been emphasized given the growing number of cases among SSA countries in recent years (IMF, 2018*b*; IMF, 2019). Several fiscal implications of conflict have been identified. Conflict can potentially contract the tax base through its disruptive effect on economic activity (Ndikumana, 2001; Barrett, 2018; IMF, 2018*b*). This reduces the fiscal space and increases deficit spending. It also strains government's ability to meet its debt service obligations, thereby creating debt sustainability problems. During periods of conflict, a high proportion of government's total spending is allocated to defence at the expense of growth-stimulating spending (Barrett, 2018).

Institutional quality also tends to be an important factor in the analysis of the determinants of public debt accumulation in SSA (see for example, Woo, 2003; and Tarek & Ahmed, 2017).

[5] These are, the commodity shocks, the easy availability of Eurodollars, the recession in the advanced countries, and the sharp increases in global interest rates.

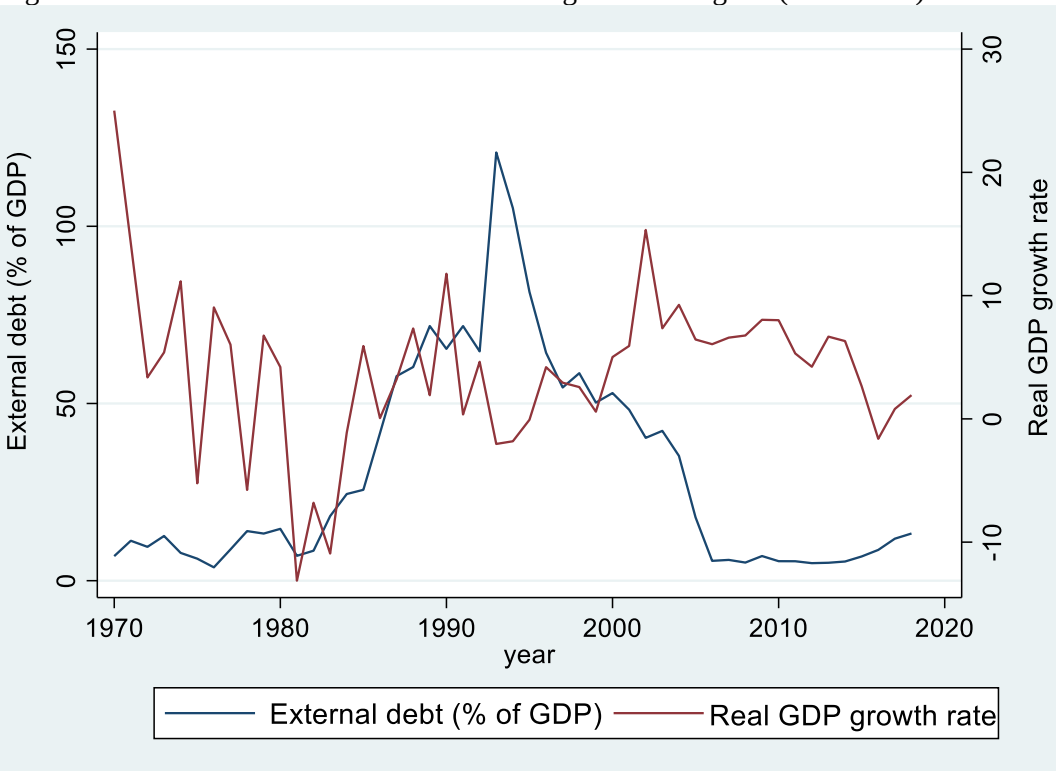
Researchers believe that a good quality of governance plays a major role in the management and sustainability of public debt. Within the political economy literature on public debt, a plethora of theoretical and empirical studies have analysed the role of governance quality, particularly in explaining why some countries were more indebted than others during peacetimes (Alesina & Tabellini, 1990; Alesina & Perotti, 1995; Alesina & Perotti, 1996; Alesina & Passalacqua, 2016; Tarek & Ahmed, 2017). Relatedly, there is the argument that the system of government plays a key role in explaining public debt, particularly in African economies (Oatley, 2010; Eisl, 2017). According to the argument, autocratic governments are relatively more prone to accumulate large amounts of debt than democratic government due to the institutions of checks and balances in the latter. Given the foregoing, and in spirit of Danso (1990) who argues in support of the need to look inwards when trying to explain Africa's debt problem, this study considers the influence of armed conflict and governance quality, in addition to economic factors.

During the era of the previous crisis, researchers made much effort, both to examine the determinants of poor economic performance in SSA, and to explain why the sub-region experienced much lower growth rates relative to other developing regions of the world (Barro & Lee, 1994; Easterly & Levine, 1997; Collier & Gunning, 1999). Whereas some studies considered the determinants of economic performance without accounting for public debt (see for example, Collier & Gunning, 1999), others such as Elbadawi, Ndulu, & Ndung'u (1997) focused mainly on the effects of the public debt crisis while employing the framework of the standard growth model (Barro & Sala-i-Martin, 2004). Given that an economic crisis was happening at the time of the debt crisis, their approach seemed to give a more realistic analysis of SSA's economic performance. Interestingly, the emerging debt problem of recent years tends to coincide with declines in economic growth rate (Melina & Portillo, 2018; IMF, 2018*b*). Figure 1-1 on page 2 depicts this. In view of the devastating effects of the previous crisis, it is, therefore, important to examine the possible economic effects of high and rising debt along with the determinants of public debt in SSA.

One of the arguments currently driving the public debt debate is the heterogeneity argument according to which the causes and effects of public debt vary considerably from one country or group to another (Panizza & Presbitero, 2013; Eberhardt & Presbitero, 2015; Ahlborn & Schweickert, 2018). It turns out that there is no consensus in the literature despite the large volume of published studies. The variabilities in findings are attributable to the influence of country-specific variables (Panizza & Presbitero, 2013). It is often difficult to fully account for

such factors within a panel data framework, which tends to limit the applicability of the findings. Whereas the existing literature on public debt has focused predominantly on the advanced and emerging market economies, massive improvements in data quality over the last couple of decades now allow researchers to focus on SSA countries. Nevertheless, even when focusing only on SSA, evidence tends to suggest that each country's public debt responds uniquely to different underlying factors (Reinhart et al., 2003; Panizza & Presbitero, 2013; Saungweme & Odhiambo, 2018). In agreement with this, the joint IMF-World Bank DSF shows that SSA countries have either entered into or faced a high risk of a debt distress at varying debt-to-GDP thresholds. These variations in debt-carrying capacity effectively make the debt-growth nexus country-specific. This study, therefore, aims to examine both the determinants and economic effects of public debt with a focus on the country case of Nigeria.

Figure 1-2. Trends External debt and economic growth in Nigeria (1970-2018)



Source: Author's compilation using data from World Development Indicators (2020)
Note: Figure 1-2 presents the trends in external debt-to-GDP ration and real GDP growth rate in Nigeria from 1970 to 2018. The drastic decline in public external debt levels as can be observed from around 2005 is the result of debt cancelation granted by the Paris Club of Creditors in 2005. Similar to what is observed for the group of debt relief beneficiaries in Fig. 1-1, the recent episode of rising debt seems to coincide with that of declining rate of growth.

The country case of Nigeria is uniquely important for two key reasons. First and foremost, Nigeria is SSA's most populated country. It comprises over 18% of the sub-region's population according to World Bank's 2020 estimates. In addition to this, the country has the largest

economy in SSA. Second, Nigeria's public debt typifies that of the generality of SSA. This is depicted in Figure 1-2 which presents the trends in external debt and economic growth in Nigeria over the period 1970-2018. The diagram depicts the impact of the debt relief interventions. Although Nigeria is not listed as a HIPC/MDRI country, it also went through an external debt crisis, similar to what was experienced in most of the other SSA countries. It reached a debt cancelation agreement with the Paris Club of creditors in 2005, the implementation of which led to a drastic reduction in the external debt levels, bringing it to an all-time low in 2006. Figure 1-2 shows that as with the debt relief countries (see Figure 1-1 on page 2), the rising external debt following the debt cancelation seems to coincide with the episode of declining rate of growth in Nigeria. This similarity suggests that the evidence from the country case study can be compared with the evidence from the panel of SSA countries. Using this comparison, we can determine whether evidence from the country case of Nigeria confirms the evidence from the studies employing panel data for SSA countries.

In view of the foregoing background and the need to examine the determinants and economic effects of public debt in SSA countries, this thesis addresses the following specific objectives:

- To investigate the determinants of public external debt in SSA countries.
- To analyse the non-linearity and threshold effects of public debt on economic growth in SSA.
- To examine both the determinants and growth effects of total public debt and its individual components i.e., external and domestic public debt in Nigeria.

1.2 Organization of the thesis

The remainder of the thesis is divided into four chapters as follows: Chapter 2 investigates the determinants of public debt in SSA countries. Following this, Chapter 3 focuses on the relationship between public debt and growth in SSA economies. Chapter 4 shifts focus to the country-specific analyses of the determinants and growth effects of public debt in Nigeria. Chapter 5 then draws conclusion and discusses some policy recommendations. It also presents limitations of the thesis and suggests areas for further research. What follows is a more detailed arrangement of the thesis.

Chapter 1 on the introduction and background is followed by three substantive chapters devoted to each of the foregoing objectives. The analyses of the determinants of public debt are carried out in Chapter 2. Mainly, the study extends the literature by focusing on the case of SSA countries. In addition, previous studies, while focusing predominantly on the advanced and

emerging economies, have mainly examined the role of macroeconomic factors. Chapter 2, therefore, extends the literature by accounting for the role socio-political factors namely armed conflict, governance quality, and regime-type. The study argues that in addition to the macroeconomic factors, socio-political factors are useful in explaining the debt situation in the sub-region. It employs a panel dataset comprising 40 SSA countries over the period of 19 years spanning 1996-2017. Empirical analyses are aided by a variety of panel econometric methods including the pooled OLS, Fixed effects, difference and System GMM. Overall, the results affirm that in addition to the macroeconomic variables, armed conflict and institutional quality are useful in explaining SSA's persistent public debt growth.

Chapter 3 addresses the salient issue of the public debt-growth nexus in SSA. Previous studies in this strand of the literature have focused mainly on the advanced countries. Thus, as with the determinants of debt, the focus on SSA countries provides an opportunity to develop a model that accounts for the unique region-specific determinants of economic growth such as governance, armed conflict, and the terms of trade shocks. Additionally, the study aims to account for the empirical issues that have been raised in the literature but ignored in the recent studies on the debt-growth nexus. It argues that previous findings, especially those on SSA have mostly ignored the fundamental empirical issues of endogeneity, cross-section dependence, and heterogeneity, giving room for a re-examination of the nexus. Lastly, the study follows the more recent approach in the literature to examine the nonlinear relationship between debt and growth. The empirical analysis is aided by a dataset comprising 24 SSA countries spanning 1980-2015. This time period is determined by availability of data on general government gross debt for SSA countries in the Historical Public Debt Database as compiled by Abbas, Belhocine, El-Ganaini, & Mark (2011).

Various panel techniques are employed depending on their capability to address the empirical issues raised. Potential endogeneity problems arising from the inclusion of the lagged dependent variable (Nickell, 1981) and from the reverse causality between debt and growth are addressed. The Nickell bias might dwindle in fixed effects estimations when the time dimension of the panel data is greater than 20 (Bond, 2002), although it is possible that the bias may remain substantial even when T is large (Judson & Owen, 1999). Therefore, in addition to the fixed effects approach, the study also employs the system GMM to ensure robustness of the results.

Both the homogeneity and heterogeneity assumptions are considered. Under the assumption of homogeneous slope, the fixed effects and system GMM methods suffice. However, given the

possibility that the slopes may not be homogeneous across countries which could severely bias fixed effects and system GMM results, the study employs the Mean Group-type techniques (Pesaran, Shin, & Smith, 1999; Chudik & Pesaran, 2015). Regarding the problem of cross-correlations, the study employs the Driscoll-Kraay panel-corrected standard errors (Driscoll & Kraay, 1998) which are robust to heteroscedasticity, serial correlation and cross correlations. Additionally, the common correlated effects approach in the heterogenous framework also accounts for cross correlations.

To account for the presence of nonlinearity, a squared term of the debt variable is included in the regressions. An important postestimation diagnostic is the Sasabuchi and Lind-Mehlum (SLM) technique of evaluating the evidence of nonlinearity (Sasabuchi, 1980; Lind & Mehlum, 2010). Panizza & Presbitero (2013) highlight the limitation of previous studies that conclude in favour of a nonlinear relationship if the coefficient on the squared term of debt is negative and significant, provided that the threshold is within the data range. There is, however, the possibility that the evidence of nonlinearity could be driven by extreme observations. The SLM test for nonlinearity is employed postestimation to ascertain whether the evidence of a non-linear relationship is truly representative of the data. Within the context of the debt-growth nexus, the test examines whether growth is truly rising at low values of debt and falling at high values of debt. Among other things, the study presents compelling evidence supporting the negative and non-linear relationship between public debt and growth. This is strongly corroborated by the nonlinearity test.

Chapter 4 presents a more rigorous analyses of both the determinants and economic effects of public debt with a focus on the country case of Nigeria. The study employs the autoregressive distributed lag approach to cointegration (Pesaran & Shin, 1999; Pesaran, Shin, & Smith, 2001) using time series spanning 1970-2017. It extends the existing literature in three unique ways: First, previous studies have focused on the external debt component whereas domestic debt has also been important in Nigeria's borrowing history. This study, therefore, employs the total public debt whilst also focusing on the individual components, i.e., the external and domestic public debt. Second, on the determinants of public debt, it accounts for both the economic, socio-political and institutional factors. Third, regarding the debt-growth nexus, previous studies focusing on Nigeria have mostly assumed a linear relationship. The more up-to-date approach is to examine the nonlinearity and threshold effects in the nexus between public debt and economic growth. On the determinants of debt, the study presents findings consistent with those of the panel studies which show that aside the economic variables, conflict is an important

determinant of public debt in Nigeria. However, the results of the public debt-growth study do not fully accord with those of the panel study. Whereas the evidence of non-linearity is common to both approaches, the estimated sustainable thresholds differ quite substantially between the panel and time series studies.

Chapter 2

Determinants of public external debt in sub-Saharan African countries

2.1. Introduction

The external debt problem, its drivers and economic effects, as well as its implication for fiscal sustainability in low-income countries, have been hotly debated among researchers and policymakers (Easterly, 2001; Forslund, Lima, & Panizza, 2011; Parfitt & Riley, 2014). Sub-Saharan Africa (SSA) has featured prominently in this debate given that most low-income countries are in the sub-region. The heavily indebted poor countries (HIPCs) intervention of 1996 and the multilateral debt-relief initiative (MDRI) of 1999, are popular outcomes of these discussions and most of the beneficiaries are SSA countries[6]. The interventions aimed to alleviate the debt burden and free up resources for the promotion of growth and development in these countries. Indeed, the debt burdens of beneficiary countries decreased dramatically as a result of the relief interventions.

The public debt problem has resurfaced following the global financial crsis, causing a reemergence of the debate, which is fueled by widespread concerns that recent trends could trigger another round of debt crises (Ndulu & Connell, 2019; Atingi-Ego, 2019). These concerns are exacerbated by a recent report by the IMF (2019) which shows that sixteen SSA countries were either facing the risk of a debt distress[7] or were already in distress.[8] Given this evolving debt situation, some pertinent questions have been raised, relating *inter alia* to the underlying factors influencing the growth of the debt, and to the economic effects thereof. This study examines the drivers of external debt growth in SSA. Much of the ongoing discussions have employed descriptive methods in measuring the extent of the debt problem and explaining its causes (IMF, 2019; Atingi-Ego, 2019). This study takes the more involving empirical approach to the problem by employing formal econometric methods.

Numerous studies have attempted to explain the underlying causes of persistent growth of public debt, particularly in peacetime, both from the economic and socio-political perspectives (for example, Barro, 1979; Tabellini & Alesina, 1990; Hall & Sargent, 2011). However, there are two drawbacks in the literature, both relating to the extent to which SSA has been

[6] 30 out of a total of 36 of them

[7] These are, Burundi, Cameroon, Cabo Verde, Central African Republic, Chad, Ethiopia, Ghana, Sierra Leone, and Zambia.

[8] These are, Republic of Congo, Eritrea, Gambia, Mozambique, Sao Tome and Principe, South Sudan and Zimbabwe.

considered. The first is that most studies on SSA countries have taken an approach focusing only on macroeconomic determinants[9] whereas the literature establishes the role of economic, political, and institutional factors (see, for example, Alesina & Perotti, 1995; Alesina & Passalacqua, 2016). The second drawback is that even the studies that consider both the economic and political factors have focused on the advanced and emerging countries. In a few cases, a regional dummy has been employed to account for SSA countries (Woo, 2003; Tarek & Ahmed, 2017).

Still, there are several reasons why SSA should be considered more in this debate. First, armed conflict has been prevalent in the sub-region in recent years and is likely to affect the fiscal position of the governments along with the dwindling prospects for economic growth (Dunne, Nikolaidou, & Chiminya, 2018). Second, from a historical perspective, the political transitions from dictatorial to democratic systems of governance by many of the countries in the sub-region in previous decades could help to explain government's borrowing and spending decisions (Oatley, 2010). Third, SSA countries are associated with large scale institutional corruption (Brautigam and Knack, 2004; Yeh, 2011; Hammadi, Mills, Sobrinho, Thakoor, & Velloso, 2019) and low quality of governance (Akanbi, 2016; Tarek & Ahmed, 2017), both of which are also likely to have strong implications for fiscal policy. Thus, rather than treat the sub-region as an outlier or dummy variable in large samples comprising the advanced and developing countries, a specific focus is important.

This study, therefore, extends the public debt literature by examining the determinants of external debt with a focus on SSA. In so doing, it accounts for both the economic and socio-political factors for a more representative analysis for SSA countries. Empirical analyses are aided by a variety of panel econometric methods namely, the pooled OLS, the fixed effects, and system GMM to facilitate comparability of the findings. The study employs a fairly balanced dataset that comprises 40 SSA countries spanning 1996-2017.

The rest of the chapter is organised as follows: Section 2.2 focuses on the review of the literature while Section 2.3 specifies the model and discusses the data and estimation methods. Then, Section 2.4 presents results and discussion of findings. In Section 2.5, the study concludes and provides some policy recommendations.

[9] See for example Decoodt (1986) Parfitt & Riley (2014) Danso (1990) Devarajan, Gill, & Karakülah (2019)

2.2 Literature Review

2.2.1 Theoretical Literature

The analysis of the determinants of public debt is rooted in the tax-smoothing model credited to Barro (1979) and Lucas & Stokey (1983). The main argument is that the issuance of public debt is attributable to the transitory changes in government expenditures, to business cycle fluctuations, and expected inflation. When evaluated against the historical behaviour of public debt, the model holds up to the evidence on several grounds. First, early evidence showed that changes in deficits and surpluses did signal future changes in government expenditure (Barro, 1979; Horrigan, 1986). Also, the variable, growth rate of output is commonly recognised as one of the most important macroeconomic drivers of public debt[10]. Furthermore, there is ample evidence showing that the sustained increases in developing countries' public debt are attributable to a continued rise in military expenditure, an indication of transitory situations of wars and ethnic conflicts which allude to the predictions of the tax smoothing model (Brzoska, 1983; Narayan & Narayan, 2008; Dunne, et al., 2018). There are, however, instances in which the model fails to align with the evidence. First, changing dynamics of fiscal policy from around 1973 in the form of systemic growth of debt across OECD countries and in some developing countries, particularly in Latin America, negated the tax smoothing model (Roubini & Sachs, 1989; Velasco, 1997). A particular cause for worry was the continued rise of fiscal deficits in peacetimes which directly contradicted the tax smoothing model (Alesina & Tabellini, 1990). In an attempt to resolve the puzzle, researchers found that socio-political and institutional factors are as important as the macroeconomic factors.

A large theoretical literature goes beyond the tax-smoothing model to provide explanations for the persistence growth of peacetime public debt. Broadly, these theories can be summarized under five categories: the models of fiscal illusion, governmental distributional conflict, regime-type, governance or institutional quality, and social and ethnic conflict. These socio-political and institutional arguments are relevant to the case of SSA where there have been high levels of public office-related corruption, high incidence of civil conflict, and low quality of institutions (Yeh, 2011; Dunne et al., 2018; IMF, 2019). Models of fiscal illusion, otherwise referred to as the political business cycle models (Buchanan & Wagner, 1976), predict that voters are confused about the actual implications of government borrowing. They therefore tend to overestimate the benefits of current government expenditures while underestimating

[10] The variable GDP growth rate is the factor most common to all the studies on the drivers of public debt across all countries

the future tax liability that the consequent borrowing portends. Such fiscal naivety of voters gives room for the government to grow the debt since it keeps voters excited and happy, thereby raising the odds of getting re-elected. Although this model is overly simplistic in assuming that voters are fiscally naïve, it helps us see how fiscal policies could be conducted in democratic setups (Alesina & Passalacqua, 2016).

Models of distributional conflict are considered from the viewpoints of inter-governmental and intra-governmental conflict. On one hand, the models of inter-governmental conflict deal with how public debt is influenced by two political parties with divergent political ideologies occupying office at different times. It predicts that public debt plays a strategic role in linking one tenure of office to another. An incumbent government, uncertain about the outcome of the next election, can build up debt levels to be inherited by the succeeding government which supposedly holds a different political ideology. This strategic use of debt by the incumbent is intended to prevent the succeeding government from going after its favoured policies since it will be pre-occupied with servicing the existing debt burden (Persson & Svensson, 1989; Alesina & Tabellini, 1990). Models of Intra-governmental conflict, on the other hand, focus on the conflict that is inherent within the government. This sort of conflict is often found within a political party or coalition government where all groups have a collective influence on government policy. Although these models do not directly explain the build-up of debt, they account for the effects of delays in fiscal adjustments and stabilizations (Alesina & Drazen, 1991). The main idea is that public debt takes long on an explosive path because each interest group chooses to sustain bargaining in a bid to shift the burden of tax to the other group.

Regime-type arguments shed light on the causes of fiscal imbalances by focusing on the differences between democratic and autocratic governments in their approaches to deficits and debt. Oatley (2010) argues that the large variations in developing countries' debt in the late 1990s is attributable to differences in regime-type. Further to the argument, autocratic regimes tend to accumulate unsustainable amounts of external debt because only a small percent of borrowed funds are invested in the provision of public goods. Similar arguments are made by (Olson, 1993) where the comparatively lower levels of public debt in democratic setups are attributed to the institutions of checks and balances which instil fiscal discipline. A counter-argument, however, is one raised earlier under inter-governmental models of conflict, where, in a democratic setup, an incumbent facing the uncertainty of re-election could use public debt either as a tool to control the outcome of the next election or as a means of influencing the

incoming government's fiscal policy (Alesina & Tabellini, 1990). In this case, large fiscal imbalances could also be a problem in democratic governments.

One of the more strongly advanced determinants of government debt is governance quality. Early research on the subject emphasized the importance of deliberate constitutional constraints to limit the natural penchant of the government to grow its size (Buchanan & Wagner, 1976; Brennan & Buchanan, 1980). As of the period before the emergence of this debate, it was observed that in the absence of any kind of inhibitions, there was a proclivity towards growing the size of public deficits and debt, due mostly to the embraced Keynesian deficit spending policy of the era (Kirchgassner, 2001). Two interrelated models of fiscal imbalance: the common pool model and the agency model, had created the need for institutional responses at the level of the budgetary process. The common pool problem arises when the conflicting spending interests of various influential groups involved in the budgetary process – legislators, the finance minister, line minister, etc. – are aggregated into the annual budget (Weingast, Shepsle, & Johnsen, 1981; Velasco, 1997). Under the assumption of weak government (Velasco, 1997), these interest groups can influence fiscal policy in ways that create distortions. The agency problem, on the other hand, is typically associated with the extent to which politicians can use public office to advance their interests at the expense of the voters (Dabla-Norris et al., 2010). This model highlights the problem of institutional corruption which is generally associated with SSA countries (Yeh, 2011).

Governance quality has been found useful in explaining the salient cross-country puzzle regarding public debt variabilities (Alesina & Perotti, 1995; 1996; Eisl, 2017). Consistent with this, Eisl (2017) develops a governance theory of public debt aimed at synthesizing the regime-type models and models of distributional conflict. The study sees governance from the lens of Kaufmann, Kraay & Mastruzzi (2011) who define the term as "*the traditions and institutions by which authority in a country is exercised*". The elements of governance in this view include political stability, control of corruption, the rule of law, government effectiveness, and regulatory quality. Eisl (2017) argues that in a governance environment where these factors are in place, public debt problems are relatively easier to contain. In a supportive argument earlier given in Woo (2003) these indicators are a good way to measure the quality of budgetary institutions which, like governance institutions, are defined as "*all the rules and regulations according to which budgets are drafted, approved and implemented*" (Alesina & Perotti, 1995:21).

Models of socio-political conflict argue from the viewpoint of disparities in income distribution. According to this argument, the widening inequality among voters can cause conflict among them, thereby leading to increased pressure on government expenditure and hence to increased public debt (Woo, 2003; 2005). Also, as modelled by Passarelli & Tabellini (2017), costly socio-political actions, typically in the form of riots, could ensue when social groups feel dissatisfied or even worse, violated by the allocation of public resources. It is argued that the more organised the social groups within a society, the more capable they are of creating socio-political uprisings which could end up having a debt-inducing effects (Passarelli & Tabellini, 2017).

2.2.2 Empirical Literature

A large and growing body of empirical literature seeks to verify the theoretical predictions of the factors underlying the persistent growth of public debt. More focus has, however, been given to the role of macroeconomic factors. In general, economic factors such as inflation, exchange rate, economic growth, trade openness, and financial development have received considerable empirical attention in the literature (see, for example, Bandiera, 2008; Sinha, Arora, & Bansal, 2011; Swamy, 2015; Cherif & Hasanov, 2018).

Two variables that have, however, recurred in this literature, particularly relating to developing countries, are economic growth and inflation (Easterly, 2001; Nguyen, 2015). Easterly (2001), for example, shows that the public debt crises in SSA during the 1980s and 1990 were the result of slowdowns in economic growth. The author argues that declining growth rates are harmful, both for the present value of government revenues and for primary surpluses which automatically raise the burden of public debt by making it more difficult to service outstanding liabilities. Consistent with this argument, recent reports show that the rising trend of SSA's public debt in the decade following the global financial crisis is attributable to declining rates of growth in the sub-region (Devarajan, Gill, & Karakülah, 2019; IMF, 2019).

In the same vein, while high and variable inflation is predicted to create fiscal imbalances that lead to increases in deficits and debt (Barro, 1979; Alesina & Drazen, 1991), the empirical evidence is mixed. Some studies support the debt-inducing role of inflation (Woo, 2003; Agnello & Sousa, 2009; Baldacci, Petrova, Belhocine, Dobrescu, & Mazraani, 2011), arguing that the variable is an indication of macroeconomic instability. In this view, inflation is said to raise deficits through the effect that it has on tax revenue and nominal interest rates (Woo, 2003 Javid, Arif, & Arif, 2011; Nguyen, 2015). Other studies have shown that inflation plays a debt-

reducing role (Reinhart & Sbrancia, 2015; Abbas et al., 2014; Akitoby, Komatsuzaki, & Binder, 2014). The most compelling argument here tends to be that unexpected inflation could be used by governments to erode the real value of debt. Consistent with this, Hall & Sargent (2011), using historical data found some evidence supporting the use of inflation to cut down on debt in the United States. Bittencourt (2015) makes similar suggestions concerning South American countries. Yet another argument suggests that inflation could reduce public debt through its effects on the primary balance and that governments may also take hold of real resources through seigniorage (Abbas et al., 2014). A counter-argument regarding the debt-reducing role of inflation within the SSA context is that public debt is predominantly issued in foreign currency and this limits the government's incentive to use inflation in managing the debt burden (de Fontenay & Milesi-Ferretti, 1995; Nguyen, 2015).

As Alesina & Perotti (1995) have observed, however, focusing only on macroeconomic factors in examining the drivers of of public debt is inadequate. They suggest a more balanced approach that considers both the macroeconomic and socio-political factors. This approach has only been taken by a limited number of previous studies. Woo (2003) employs a sample of 57 developed and developing countries and considers a large number of economic and socio-political variables, but with more focus on the latter. The study finds *inter alia* that income inequality, political instability, and institutional quality are highly important in their sample. Similarly, Agnello & Sousa (2009) on a sample of 125 countries find that political instability and regime-type are instrumental in explaining deficit volatility in their sample. Colombo (2009) focuses only on a sample of developing countries and finds a role for both economic and socio-political factors. Contrarily, Bittencourt (2015) takes a similar approach using a sample of South American countries but finds that socio-political variables are not significant. Instead, the study finds economic growth and inflation as the useful explanatory factors of public debt growth in their sample. A generally accepted position in this literature is that in addition to the economic factors, socio-political variables are very useful in deepening the understanding of the factors that drive the movements in public debt.

One notable feature of this literature is the limited focus given to the case of SSA. In previous studies, there was the common practice of considering the sub-region through the use of a regional dummy (Woo, 2003; Agnello & Sousa, 2009; Nguyen, 2015). As observed by Bittencourt (2015) who focuses on the case of South American countries, generalizations made from the inclusion of a regional dummy are often inadequate representation of the specific realities faced by such countries. SSA countries specifically face the endemic problems of

conflict, poor quality of institutions, widespread corruption, low levels of regulatory quality (Bräutigam & Knack, 2004; Yeh, 2011; Dunne et al., 2018; Hammadi, Mills, Sobrinho, Thakoor, & Velloso, 2019) among other such problems, which may only be adequately accounted for through a focus on the sub-region. Moreover, SSA is made up of mostly low-income countries, coupled with the fact that the majority of the heavily indebted poor countries (HIPCs) are in the sub-region. These unique characteristics warrant a specific focus on SSA in this literature.

Previous studies have considered a variety of socio-political variables including corruption, conflict, regime-type, and institutional quality. The role of corruption has been highlighted by Cooray, Dzhumashev, & Schneider (2017) who employ a sample of 126 countries and use as the measure of corruption, the Worldwide Governance Indicator (WGI) *control of corruption*. Pani (1996) notes that a well-known link exists between corruption and the conduct of public expenditure. In a corrupt socio-political environment, an opportunity is given to a dishonest government to make illicit gains from public resources at the expense of the productive uses of such resources. The effect of armed conflict has been shown by the study of Dunne et al. (2018) which, interestingly, focuses on SSA countries. Their study suggests that military expenditure is an important determinant of public debt in countries that have been through conflict. Empirical evidence regarding the role of regime-type has been provided by Oatley (2010) and Eisl (2017). In both of these studies, democratic regimes tend to have a more conducive environment for fiscal discipline than autocratic regimes.

The socio-political variable that has received the most attention, both in the theoretical and empirical literature, is institutional quality. The variable has been found useful not only in explaining cross-country differences in peacetime accumulation of debt but also in determining the extent to which other socio-political variables are important (Alesina & Perotti, 1995; Woo, 2003; Eisl, 2017). Three reasons could be adduced as to why governance quality is relatively more emphasized than other socio-political determinants of debt. First, high governance quality improves government's fiscal position by raising the efficiency of the revenue-collection process and providing a regulatory and monitory mechanism that guides the disbursement of government resources (Woo, 2003; Alesina & Passalacqua, 2016; Tarek & Ahmed, 2017). Second, there is a well-known link between institutional quality and economic growth. Governance quality could, therefore, affect public debt through the effect that it has on economic growth, given that growth tends to have a debt-reducing effect (Barro, 1979; Easterly, 2001). Third, governance quality measures such as political stability, regulatory

quality, and the rule of law are altogether a good way to measure the quality of a country's budgetary institutions (Woo, 2003).

Given its important role, a considerable amount of literature has been published on the link between institutional quality and public debt[11]. In recent panel studies, the Worldwide Governance Indicators of Kaufmann et al. (2011) have been employed as measures of institutional quality. For example, Tarek & Ahmed (2017) consider a sample of Middle East and North African (MENA) countries while Eisl (2017) employs a global sample. Both studies employ the WGIs including *political stability*, *regulatory quality*, *control of corruption*, *rule of law* and *government effectiveness* while controlling for macroeconomic determinants. The findings support the role of governance quality in their samples. Other measures of governance quality have also been employed by previous studies. Woo (2003) employs the International Country Risk Guide (ICRG) measure of institutional quality that is popular in the growth literature. It comprises different aspects of governance including government repudiation of contracts, expropriation risks, the rule of law, and corruption. The study also finds strong support for institutional quality. Colombo & Longoni (2009) and Bittencourt (2015) measure institutional quality using *constraints on the executive* from the Polity IV database. While support is found for the debt-reducing role of institutional quality in the former study, none is found in the latter. What is interesting in all these studies is that, regardless of the measure of governance quality employed, the results are mostly the same: governance quality seems to have a negative relationship with public debt and thus plays a debt-reducing role.

Overall, it is clear from previous research, that only a limited number of studies have considered a combination of macroeconomic and socio-political factors in attempting to explain the determinants of public debt. Furthermore, SSA countries have generally been neglected in this literature despite the importance of the sub-region regarding its specificities of conflict, corruption, low governance quality, macroeconomic instability, and dwindling growth prospects. This study contributes to the existing literature by employing a combination of economic and socio-political factors and by considering an empirical model that reflects the economic and political nuances of SSA.

Regarding the empirical approaches in previous studies, several panel estimation techniques have been employed to examine the determinants of public debt. Popular among these are the traditional pooled OLS, the fixed effects, and random effects approaches (Alesina, Hausmann,

[11] See for example, Roubini and Sachs (1989) on advanced countries and Alesina, Hausman and Hommes (1999) on Latin American countries.

Hommes, & Stein, 1999; Woo, 2003; Tarek & Ahmed, 2017). The choice of these estimators is apparently being influenced by the need to deal with the unobserved issues of country and time fixed effects. Nonetheless, there are two other potential empirical issues that have been considered in this literature. One arises when a dynamic model is specified with inclusion of the lagged dependent variable as one of regressors. The persistence of public debt justifies such a specification (see for example, Dunne et al., 2018). Dynamic panel models may yield biased estimates in the traditional pooled OLS due to the reverse causality between public debt and its lagged term (Nickell, 1981). The bias can reduce to negligible levels in fixed effects estimations, provided that the time dimension of the data is longer than 20 periods (Kiviet, 1995; Bond, 2002; Baltagi, 2005). Research, however, shows that the bias might not be minimized even with a time dimension as long as 30 periods (Judson & Owen, 1999). The other potential issue arises from the inclusion of economic growth as key determinant of public debt which leads to the well-known issue of simultaneity bias in the debt-growth relationship.

Some recent studies have taken the aforementioned issues into account. Colombo & Longoni (2009), for example, employ the fixed effects and system GMM, in addition to the traditional pooled OLS in their study. Bittencourt (2015) employs the instrumental variables fixed effect. The approach in this study is to employ a variety of panel econometric techniques to account for these issues, particularly, the dynamic panel bias and the potential simultaneity between public debt and growth.

2.3 Model specification, data, and methods of estimation

2.3.1 Model specification and data

Given the theoretical and empirical review of the literature, this study estimates a model that includes both economic and socio-political determinants. Furthermore, having pointed out the need to account for the specificities of SSA, this study follows the modelling approach of Woo (2003) who focuses more on socio-political variables but also considers macroeconomic variables. Specifically, Woo's (2003) model combines the features of the tax-smoothing model (Barro, 1979) with the political-economy models of fiscal deficits and debt (for example, Persson & Svensson, 1989; Tabellini & Alesina, 1990). So, this study adopts Woo's (2003) model with some extensions. First, the study employs a dynamic form of the model to reflect the evidence that SSA's public debt follows an autoregressive process and exhibits persistence (Dunne et al., 2018). Second, in addition to including the measures of growth and inflation from the macroeconomic viewpoint, the model includes a measure of the exchange rate to

reflect the large foreign currency composition of public debt in SSA. Third, from the socio-political and institutional viewpoint, it controls for the role of *conflict, institutional corruption, regulatory quality, political instability, political regime, and the rule of law*. The majority of these political-economy variables have been taken from the database of the Worldwide Governance Indicators (WGI) developed by Kaufmann et al. (2011). Specifically, four WGI indicators have been employed namely, *control of corruption, political stability, regulatory quality*, and *rule of law*. Additionally, a composite measure of the four variables is constructed with the aid of principal component analysis. This composite indicator is then included as the measure of governance quality. The dynamic model employed in this paper is, therefore, specified as follows:

$$lexdy_{it} = \alpha_0 + \alpha_1 lexdy_{it-1} + \alpha_2 growth_{it} + \alpha_3 inf_{it} + \alpha_4 lrexr_{it} + \alpha_5 conflict_{it} + \alpha_6 regime_{it} + \alpha_7 relief_{it} + \alpha_8 gfc_{it} + \alpha_9 Z_{it} + \varphi_i + \eta_t + \epsilon_{it} \quad (2.1)$$

where i and t denote country and time respectively; φ_i and η_t denote the country-specific fixed effect and time fixed effects respectively, and ϵ_{it} is the error term; the dependent variable ($lexdy_{it}$) is the log of external debt as a share of GDP; $growth_{it}$ stands for the growth rate of GDP; inf_{it} is the inflation rate which is included as a measure of macroeconomic uncertainty; $lrexr$ is the log of real exchange rate; $conflict_{it}$ is the conflict dummy which is an important socio-political variable in the model; a debt relief dummy ($relief_{it}$) and financial crisis dummy (gfc_{it}) are also included; Z_{it} represents the indicators of governance. A more detailed description of the variables, the a priori theoretical expectation and sources of data are discussed next.

The log of external debt as a share of GDP which enters as the dependent variable is defined as debt "owed to non-residents, repayable in currency, goods or services" (WDI, 2019). It is made up of public, publicly guaranteed, private non-guaranteed long-term debt, use of IMF credit, as well as short term debt. Data on external debt-to-GDP ratio are obtained from WDI.

Following (Barro, 1979) and Easterly (2001), the level of economic activity is captured via the inclusion of the growth rate of real GDP ($growth$). It is expected that a fast and sustained increase in economic growth will tend to bring about declines in the debt burden. Data on *real GDP growth rate* are collected from WDI.

Following Barro (1979), Escolano (2010) Cherif & Hasanov (2018) and consistent with recent policy discussions on SSA's public debt growth the GDP deflator (inf) is included to capture the role of macroeconomic uncertainty. The variable is measured in percentage terms and

captures the rate at which prices change on an annual basis throughout the economy. The predicted sign of this variable is not clear. On one hand, high levels of inflation are an indication of macroeconomic uncertainty (Nguyen, 2015) which could create volatility in budget deficits through its effect on government revenue and spending (Javid et al., 2011). In this case, the variable is predicted to have a positive sign in the regression. On the other hand, higher inflation may be debt-reducing when used by the government to manage the debt. In this case the sign would then be negative (Akitoby et al., 2014; Reinhart & Sbrancia, 2015). Data on the GDP deflator are obtained from the World Development Indicators.

Another variable included in the model is the log of real exchange rate ($lrexr$) given the focus on external debt and its denomination in foreign currency. The expected sign of the variable is ambiguous. On one hand, due to valuation effects, a depreciation of the real exchange rate may tend to lead to an increase in external debt. It is in this line of argument that sudden debt explosions have been linked to the effect of real depreciation (Campos, Jaimovich, & Panizza, 2006). On the other hand, there is the possibility that exchange rate depeciation could be debt-reducing if it induces an increase in export revenues that enhance the country's ability to service its debt (Gnangnon, 2014). Following Habib, Mileva, & Stracca (2017), the study employs as the measure of real exchange, the bilateral rate measured as the price level of Purchasing Power Parity GDP – US$ (PPP/EXR) obtained from Penn World Tables (PWT 9.1).

A relief dummy ($relief$) is included to capture the large representation of the beneficiaries of the debt relief initiatives in the sample. The expected sign of the debt relief dummy is ambiguous. A positive sign could be interpreted as implying that debt relief provides an opportunity for beneficiary countries to re-accumulate debt while a negative sign could be ascribed to the fall in public debt due to debt forgiveness. The model also includes a crisis dummy to account for the impact of the global financial crisis on SSA's public debt. The variable is expected to have positive sign in regressions.

Turning to socio-political factors, the study follows Woo (2005), Passarelli & Tabellini (2017), and Dunne et al. (2018) to account for the role of armed conflict. This is included as a dummy variable which takes on the value one in a year of armed conflict, that is, a year in which there are at least 25 battle deaths, and zero otherwise. The variable is expected to have a positive sign in the regression. The conflict dummy is constructed using the Uppsala Conflict Data Programme (UCDP) and the Peace Research Institute Oslo (PRIO) armed conflict database.

The model also includes a proxy for regime type ($regime$) which captures whether a country operates a democratic or autocratic regime. In the Polity IV database, this variable represents a combined polity score which is calculated by subtracting the values of autocratic regime variable from those of democratic regime, yielding a single score which ranges from $+10$ (full democracy) to -10 (full autocracy). Using this score, a dummy variable is constructed which takes the value of 1 if a country lies within the positive range (that is, democratic) and zero otherwise. Democratic regimes are expected to have lower levels of debt than autocratic regimes given the presence of checks and balances in the former. Data on $regime$ are taken from the Polity IV database.

The role of governance quality is captured in the variable Z_{it} through the Worldwide Governance Indicators of Kaufmann et al. (2011). Each of the variables is constructed as an estimate which indicates a country's score on the aggregate indicator, in units of a standard normal distribution, approximately ranging between -2.5 and 2.5. For each measure of governance quality, higher values are associated with lower levels of debt and vice versa. Thus, a negative sign is expected for all the governance variables. Four measures of governance quality have been included to capture at least one aspect of our conjectures regarding the determination of SSA's public debt. The variable *rule of law* ($rule$) captures perceptions of the extent to which citizens have confidence in and abide by the rules of society. In particular, this relates to the quality of contract enforcement, property rights, the police, and the courts.

The study also controls for the role of corruption through the indicator *control of corruption,* which is defined as the extent to which public power is exercised for private gain. It includes both petty and grand forms of corruption. SSA countries are often associated with large scale institutional corruption (Bräutigam & Knack, 2004; Hammadi et al., 2019; IMF, 2019a), a factor that is likely to affect the way borrowed funds are utilized. Regulatory quality ($regquality$) captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. According to Eisl (2017) higher levels of regulatory quality can lower public debt through the increased effectiveness of tax collection which raises government revenue. Additionally, high regulatory quality can provide a level playing field for firms and investors, thereby, raising the rate of investments which can ultimately lower the government's need to borrow.

Following Woo (2003), the influence of political instability is also considered. Theoretically, the lower the likelihood of re-election, the more likely it is for an incumbent to leave large amounts of debt for the successor. According, to this argument, frequent changes of

government may serve to raise the debt-burden, particularly when the incumbent looks to hand over power to an ideologically different political party with different preferences (Persson & Svensson, 1989; Alesina & Tabellini, 1990). The variable *political stability* measures the perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism.

One characteristic feature of the Worldwide Governance Indicators is the high degree correlation between the variables (Table 2-2 demonstrates this) which makes it inadvisable to include them in one regression. The usual practice is to construct a composite measure of the variables or include them individually in different estimations (Woo, 2003; Eisl, 2017)). In this study, both steps are taken. First, each of the variables are allowed to enter the model in turn. Next, a composite index constructed through principal component analysis[12] (Table 2A-1 of the Appendix A) and labelled governance quality ($govqual$), is then included. The Kaufmann et al. (2011:222) definition of governance quality as "*the traditions and institutions by which authority in a country is exercised*" highlights three key dimensions of governance according to which the indicators are constructed. These are: the process of government selection, monitoring and replacement, government capacity to formulate and implement sound policies, and the extent to which these institutions are respected by the citizens and the state. As suggested in recent policy discussions, Africa's growing levels of public debt could be linked to its weakening policies and institutions (Devarajan et al., 2019)

An alternative measure of governance quality, *constraints on the executive* (*xconst*), is employed for robustness. $xconst$ refers to the extent to which a government is subject to checks and balances in all of its decision-making processes. It is constructed using a seven-category scale where countries with the highest institutionalized constraints are ranked 7 and countries with the lowest constraints are ranked 1. As with the governance indicators, high values of $xconst$ are indicative of higher institutional quality and thus, low levels of debt. It is, therefore, expected that the variable will have a negative sign in the regressions. Data on $xconst$ are taken from the Polity IV database.

To analyse the determinants of debt in SSA, the study employs a fairly balanced annual dataset[13] comprising 40 countries over 19 years, that is, from 1996 to 2017. The study period

[12] Kourti (2009:30) defines principal component analysis (PCA) as a procedure for cutting down on the number of variables in an analysis to include only uncorrelated variables that capture most of the variability. Thus, PCA leaves us with new variables which are a linear combination of the original variables.

[13] The WGI variables have three missing observations for 1997, 1999, and 2001. To have a uniform dataset, these years have also been removed for all other variables.

is determined by the availability of data on socio-political variables, particularly, the WGIs. This period includes the era of debt-relief interventions. It also covers the period of the new wave of growing debt in SSA which coincides with the wake of the global financial crisis. Overall, the data for this study have been sourced from a variety of sources. Economic variables have been taken from the World Development Indicators while socio-political and institutional variables are obtained from the Worldwide Governance Indicators, the UCDP/PRIO database, and the Polity-IV database. Table 2-1 contains the list of countries included in the sample.

Table 2-1. List of countries

Angola	Gambia The*	Sierra Leone*
Benin*	Ghana*	South Africa
Botswana	Guinea*	Sudan
Burkina Faso*	Guinea Bissau*	Tanzania*
Burundi*	Kenya	Togo*
Cabo Verde	Lesotho	Uganda
Cameroon*	Madagascar*	Zambia*
Central African Rep*	Malawi*	Zimbabwe
Chad*	Mali*	
Comoros*	Mauritania*	
Congo DR*	Mauritius	
Congo Rep*	Mozambique*	
Cote d'Ivoire*	Niger*	
Eswatini	Nigeria	
Ethiopia*	Rwanda*	
Gabon	Senegal*	

* denotes that a country was a beneficiary of debt relief.

Where possible, variables have been expressed in their log forms to aid the cross-country comparison. In particular, *external debt to GDP ratio* and *exchange rate* are used in their log forms while all other variables are used in their level form.

Table 2-2 Summary statistics and correlations

	ext debt	gdp growth	inflation	real ex	conflict	regime	corr	pol. stab	reg. quality	rule	exc. const
summary statistics											
mean	57.39	4.555	19.89	0.404	0.221	0.870	-0.729	-0.628	-0.682	-0.567	3.975
max	504.5	33.63	4,801	1.163	1	1	1.057	1.127	1.077	1.007	7
min	3.899	-36.39	-29.69	0.129	0	0	-1.884	-2.298	-2.130	-1.859	0
std. dev.	50.86	4.650	200.3	0.125	0.415	0.337	0.581	0.569	0.627	0.688	1.960
Observations	760	760	760	760	760	760	760	760	760	760	760
correlations											
ext debt (% of gdp)	1										
gdp growth	-0.22***	1									
inflation	0.030	-0.090*	1								
real exchange rate	-0.355***	-0.015	-0.023	1							
conflict	0.0041	0.049	0.083*	-0.054	1						
regime	0.130***	-0.009	0.021	0.026	-0.002	1					
corruption	0.129***	-0.068	0.089*	0.009	0.191***	0.570***	1				
political stability	0.171***	-0.012	0.128***	-0.009	0.243***	0.448***	0.906***	1			
regulatory quality	0.192***	-0.048	0.099**	-0.024	0.272***	0.504***	0.897***	0.872***	1		
rule of law	0.138***	-0.031	0.087*	-0.086*	0.343***	0.375***	0.724***	0.735***	0.807***	1	
executive const.	0.0217	-0.047	0.065	0.084*	0.177***	0.007	0.206***	0.221***	0.253***	0.279***	1
multicollinearity test using VIF											
VIF	-	1.03	1.07		1.18	2.33	8.23	6.44	7.04	5.77	1.15

Note: *, ** and *** denote significance at 10%, 5% and 1% respective.

Table 2-2 presents summary statistics and correlations. External debt to GDP ratio has an average value of 57.4% for all SSA countries over the period 1996-2017. This value, however, varies widely across the sample as indicated by the large standard deviation as well as the large difference between the minimum and maximum values. The maximum value is coming from Guinea Bissau where, before the 1998 debt relief, debt ratio stood at about 504%. Inflation is high on average and also varies widely among the groups in the sample. This indicates that many SSA countries have experienced high levels of macroeconomic instability between 1996 and 2017. Double-digit average inflation can be found in 11 countries including Angola, Nigeria, and Sudan. Average real GDP growth rates also exhibit variabilities across countries, from the highest value of 33.6% in Chad in 2004 to the lowest value of -36.4% in Central African Republic as of 2013. Correlation and Variance inflation factor (VIF) test results are also obtained to avoid the problem of multi-collinearity among the explanatory variables. The results show that there is a high correlation among the WGI variables namely, *rule of law*, *control of corruption*, *political stability*, and *regulatory quality*. As a result, we include each of the variables in separate estimations.

2.3.2 Methods of data analysis

As discussed in the literature review, the choice of estimation techniques in this study is informed by the need to address the potential dynamic panel bias and the simultaneity bias in the debt-growth relationship. The study, therefore, applies a variety of panel data techniques including the pooled OLS, the fixed effects, and the dynamic difference and system GMM methods (Arellano & Bond, 1991; Arellano & Bover, 1995; Blundell & Bond 1998). If the model is correctly specified, and the explanatory variables are not correlated with the error terms, the pooled model could yield consistent estimates (Cameron & Trivedi, 2005). Pooled regressions, however, do not account for the unobserved fixed effects when they are present, which could lead to inconsistent results. Moreover, pooled OLS is not suitable for dynamic models (Baltagi, 2005). The fixed effects method is thus employed to account for the possible presence of unobserved effects.

There is the argument that the fixed effects technique may help to overcome the Nickell bias in dynamic models with sufficiently large T (Kiviet, 1995; Bond, 2002; Baltagi, 2005), Nevertheless, the data available in this case does not satisfy the large T criterion. The study, therefore, employs the difference and system GMM approaches (Arellano & Bond, 1991; Arellano & Bover, 1995; Blundell & Bond, 1998) which allow for the use of internal instruments to deal both with the dynamic panel bias, and the simultaneity between public debt

and economic growth. Accordingly, the study instruments for the lagged dependent variable through its second and third lags, and for the growth rate of GDP through its first and second lags. Following the suggestion of Roodman (2009) the country and time effects are accounted for in the GMM framework. Regarding the diagnostic tests in GMM framework, the study relies on Hansen's test of overidentifying restrictions and Arellano-Bond test for second-order serial correlation. In both tests, the failure to reject the null hypothesis will give support to the results. Of the various estimation methods employed, the GMM methods are considered relatively more reliable compared to the Pooled OLS and fixed effects techniques. Nevertheless, the use of different estimation techniques helps to aid comparability of results.

2.4 Results and discussion

Table 2-3 reports the pooled OLS and fixed effects results while Table 2-4 reports the difference and system GMM results. Each regression includes one of the Worldwide Governance Indicators given the high correlation among the variables. Specifically, *control of corruption*, *political stability*, *regulatory quality*, and the *rule of law* are each included in columns 1, 2, 3 and 4, respectively. Other than this difference, all regressions include the same number of macroeconomic and socio-political variables. In Table 2-5, results from all three estimation methods are presented in two sets: the first set includes the composite measure of governance quality while the second set includes the alternative measure of governance, i.e., the constraints on the executive. This is done as a robustness check on the main results.

Regarding the lagged dependent variable, the results suggests that external debt follows a strong autoregressive process with a positive estimate that is significant at 1% across all the regressions in Tables 2-3, 2-4, and 2-5. This accords with several previous studies such as Bittencourt (2015) for South American countries, Umoh, Onye, & Atan (2018) for West African countries, and Dunne et al. (2018) for the case of SSA. It reflects the persistent nature of external debt in SSA countries. The debt-inducing impact of the global financial crisis is strongly confirmed in the regressions as the crisis dummy presents a positive and significant impact in all cases except the fixed effects regression of Table 2-5. Dunne et al. (2018) presents supportive evidence in this regard.

Economic growth seems to play an important role in the model. Across the pooled OLS, fixed effects and GMM estimations, the variable presents a negative and strongly significant estimate, affirming its debt-reducing impact on public debt. The result is consistent with several previous studies such as Easterly (2001) Hall and Sargent (2011), and Bittencourt (2015). In particular, the results corroborate Easterly's (2001) findings that the public debt crisis in SSA

Table 2-3. Pooled OLS and fixed effects estimations

	OLS regressions				fixed effects regressions			
	1	2	3	4	1	2	3	4
ext. debt (t-1)	0.934***	0.937***	0.937***	0.932***	0.829***	0.833***	0.831***	0.829***
	(0.015)	(0.015)	(0.015)	(0.016)	(0.016)	(0.016)	(0.017)	(0.016)
gdp growth	-0.016***	-0.015***	-0.016***	-0.015***	-0.014***	-0.014***	-0.014***	-0.014***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.0016)	(0.0016)	(0.0016)	(0.0016)
Inflation	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
real ex. rate	0.012	0.010	0.011	-0.000	0.063	0.043	0.061	0.063
	(0.032)	(0.032)	(0.032)	(0.033)	(0.055)	(0.055)	(0.055)	(0.055)
conflict	0.053**	0.048**	0.057**	0.049**	0.043*	0.041*	0.045*	0.043*
	(0.021)	(0.022)	(0.022)	(0.022)	(0.023)	(0.022)	(0.023)	(0.023)
financial crisis	0.127***	0.128***	0.130***	0.133***	0.411***	0.281***	0.401***	0.412***
	(0.046)	(0.046)	(0.046)	(0.046)	(0.083)	(0.074)	(0.083)	(0.084)
relief	0.019	0.008	0.011	0.003				
	(0.022)	(0.022)	(0.022)	(0.022)				
regime-type	0.035	0.006	0.025	-0.0023	0.071	0.089	0.042	0.073**
	(0.035)	(0.034)	(0.034)	(0.033)	(0.047)	(0.054)	(0.058)	(0.035)
corruption	-0.042***				-0.001			
	(0.012)				(0.025)			
political stab.		-0.034***				-0.000		
		(0.012)				(0.031)		
regulatory qua			-0.039***				-0.021	
			(0.012)				(0.029)	
rule of law				-0.018**				0.0017
				(0.009)				(0.028)
constant	11.49*	11.92*	12.97**	13.26**	70.94***	46.35***	69.44***	71.06***
	(6.586)	(6.604)	(6.512)	(6.533)	(13.71)	(10.97)	(13.81)	(14.05)
time fixed effe	no	no	no	no	yes	yes	Yes	yes
R-squared	0.898	0.897	0.898	0.896	0.868	0.867	0.868	0.868
obs.	720	720	720	720	720	720	720	720

Notes: Robust standard errors in parenthesis. ***, **, & * denote significance at 1%, 5% and 10% respectively. External debt-gdp ratio and real exchange rate are taken in log.

During the decade of the 1980s and 1990s were the result of slowdowns in economic growth. Similarly, recent discussions focusing on the emerging problem of public debt in SSA have featured the central role of the dwindling prospects of economic growth (IMF, 2019; Devarajan

et al., 2019). This study therefore reiterates the need for SSA countries to focus on creating an economic environment that encourages growth and prosperity.

Table 2-4. Difference and system GMM estimates

	difference GMM				system GMM			
	1	2	3	4	1	2	3	4
lagged ext. debt	0.906***	0.925***	0.924***	0.922***	0.905***	0.926***	0.923***	0.921***
	(0.028)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.026)	(0.026)
gdp growth	-0.015***	-0.015***	-0.015***	-0.015***	-0.014***	-0.014***	-0.014***	-0.015***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)
inflation	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
real ex. rate	0.069	0.067	0.063	0.066	0.034	0.039	0.037	0.034
	(0.047)	(0.047)	(0.047)	(0.047)	(0.030)	(0.030)	(0.029)	(0.029)
conflict	0.048*	0.053**	0.056**	0.053**	0.034**	0.038**	0.044**	0.040**
	(0.025)	(0.025)	(0.025)	(0.025)	(0.016)	(0.016)	(0.018)	(0.017)
financial crisis	0.243***	0.187***	0.187***	0.190***	0.252***	0.199***	0.200***	0.202***
	(0.068)	(0.058)	(0.059)	(0.058)	(0.066)	(0.058)	(0.059)	(0.058)
regime	0.069*	0.038	-0.0043	0.064**	0.035	0.0087	0.030	0.003
	(0.038)	(0.041)	(0.032)	(0.027)	(0.031)	(0.026)	(0.027)	(0.029)
corruption	-0.011				-0.028**			
	(0.024)				(0.010)			
pol. stability		-0.026				-0.027**		
		(0.026)				(0.012)		
reg. quality			-0.053**				-0.034***	
			(0.024)				(0.012)	
rule of law				-0.011				-0.016*
				(0.025)				(0.009)
time fixed effec	yes	yes	yes	yes	yes	yes	Yes	yes
hansen test	0.755	0.706	0.781	0.742	0.934	0.773	0.944	0.919
A-B test	0.659	0.648	0.659	0.640	0.700	0.660	0.664	0.645
Observations	680	680	680	680	720	720	720	720
Observations	680	680	680	680	720	720	720	720

Notes: Robust standard errors in parentheses. ***, **, and * denote significance at 1%, 5% and 10% respectively. External debt-gdp ratio and real exchange rate are taken in log. The lagged dependent variable and GDP growth are treated as endogenous. Orthogonal deviations are employed as recommended for unbalanced panels (Roodman, 2009). A-B denote the Arellano-Bond test for second order serial correlation. For brevity, only the p-values for the Hansen and A-B test are presented.

Inflation is yet another variable that is consistently significant across the results in Tables 2-3 to 2-5. However, the estimate comes with the unexpected negative sign which seems to suggest that increases in inflation rate may be debt-reducing for the case of SSA. Similar evidence has been presented by Bittencourt (2015) for the case of South American countries. As a measure of macroeconomic uncertainty, we would expect, a priori, a positive effect on public debt which would be debt-inducing in accordance with the tax smoothing model (Barro, 1979). Contrary

Table 2-5. Estimations with composite measure of governance and executive constraints

	includes composite measure of gov quality			includes executive constraints		
	pooled OLS	fixed effects	system GMM	pooled OLS	fixed effects	system GMM
lagged external debt	0.940***	0.849***	0.942***	0.915***	0.842***	0.925***
	(0.015)	(0.013)	(0.026)	(0.015)	(0.013)	(0.027)
gdp growth	-0.016***	-0.015***	-0.017***	-0.012***	-0.014***	-0.012**
	(0.002)	(0.002)	(0.005)	(0.002)	(0.002)	(0.005)
inflation	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
real exchange rate	0.006	0.012	0.042	0.050	0.020	0.049
	(0.032)	(0.059)	(0.034)	(0.034)	(0.058)	(0.032)
conflict	0.062***	0.047*	0.101	0.028	0.046*	0.037**
	(0.022)	(0.024)	(0.103)	(0.019)	(0.023)	(0.016)
financial crisis	0.130***	0.028	0.073**	0.220***	0.195***	0.223***
	(0.046)	(0.031)	(0.032)	(0.053)	(0.055)	(0.0584)
relief	0.009			0.021		
	(0.022)			(0.021)		
regime-type	0.025	0.034	0.036	-0.028	0.064**	-0.019
	(0.035)	(0.055)	(0.036)	(0.029)	(0.028)	(0.037)
governance quality	-0.038***	-0.019	-0.045**			
	(0.012)	(0.030)	(0.019)			
executive constraints				-0.016**	-0.010	-0.015*
				(0.007)	(0.011)	(0.008)
constant	12.18*	0.636***	0.365***	30.43***	34.84***	29.29***
	(6.546)	(0.157)	(0.132)	(7.480)	(7.700)	(7.582)
time fixed effects	yes	yes	yes	yes	yes	yes
Hansen test			0.786			0.829
A-B test			0.684			0.669
R-squared	0.897	0.865		0.917	0.869	
Observations	720	720		702	702	702

Notes: Robust standard errors in parentheses. *, **, and *** denote significance at 10%, 5% and 1% respectively. External debt-gdp ratio and real exchange rate are taken in log. In the GMM regressions, the lagged dependent variable and GDP growth are treated as endogenous. A-B denote the Arellano-Bond test for second order serial correlation. Only the p-values for the Hansen and A-B tests are presented.

evidence, however, suggest that the government may use inflation as an instrument for cutting down on the debt burden (Hall & Sargent, 2011; Akitoby et al., 2014; Reinhart & Sbrancia, 2015). The economic significance of the role of inflation in this study could be related to the support that it gives to the latter argument. Nonetheless, this is contrasted by the argument that the use of unexpected inflation to reduce the debt burden is only plausible where debt is denominated in the domestic currency (de Fontenay & Milesi-Ferretti, 1995; Nguyen, 2015). Accordingly, SSA's governments have no incentive to use inflation to reduce the external debt since such borrowing is often denominated in foreign currency. The debt effect of inflation is thus an important line of inquiry that deserves more attention in the empirical literature.

Among the socio-political variables, conflict is positively and significantly associated with public debt across all the regressions in Tables 2-3 and 2-4. Table 2–5 shows similar estimates in most cases. Dunne et al. (2018) finds supportive evidence showing that armed conflict is an important determinant of the debt burden in conflict affected SSA. Several other studies have corroborated this hypothesis by showing that military expenditure is a key determinant of debt (Dunne, Perlo-Freeman, & Soydan, 2004; Azam & Feng, 2017). Thus, this study confirms the association between conflict and public debt with important implications for SSA countries where the problem of conflict has been rife in recent years.

Although the Worldwide Governance Indicators have been included in the model on an individual basis, the results, overall, indicate that governance quality plays a key role in our understanding of the determinants of public debt in general, and SSA in particular. Specifically, the results in Tables 2-3 and 2-4 show that each of the indicators of governance has a statistically significant debt-reducing impact in the model. Table 2-5 which includes a composite measure of governance along with an alternative measure – executive constraints, presents supportive evidence in most cases.

While the use of the Kaufmann, Kraay and Mastruzzi's governance indicators is relatively new in the empirical literature, the findings are consistent with several recent reports from studies that have employed these indicators. Eisl (2017) for example, presents supportive evidence showing that governance quality, both in the form of the individual indicators and a composite measure, lowers public debt by reducing the government's incentive to "borrow from the future". Similarly, Tarek & Ahmed (2017) finds that political stability, regulatory quality, and rule of law are useful in explaining public debt in a sample of the Middle East and North African (MENA) countries. In Cooray et al. (2017) focusing on developed and developing countries, the indicator of *control of corruption* also presents supportive evidence. The results tend to mirror Devarajan's et al. (2019) findings on SSA countries who observed the Country Policy and Institutional Assessment (CPIA) rating between 2007 and 2018 and found that in most SSA countries, policies and institutions have either been deteriorating or have not improved over the period. This study, therefore, reaffirms the need for SSA to pay close attention to its institutions and policies as one of the most crucial steps toward containing the debt problem in the sub-region.

2.5 Conclusion and policy recommendations

The problem of public debt is a recurring macroeconomic problem in SSA countries. In the past, the external debt problem had led to debt relief interventions that brought about large reductions in the debt burden of many SSA countries. Following the wake of the global financial crisis, public debt has been on the rise in SSA and has prompted a re-emergence of the debate in the sub-region. This study examined empirically the factors that might be responsible for this rising trend of public external debt in the sub-region. The analysis was aided by a variety of panel estimators including the pooled OLS, the fixed effects, and the dynamic system GMM methods. The results are quite interesting and contribute to the understanding of the factors that influence public debt in general and of SSA countries. Specifically, the study presents compelling evidence in support of the debt-reducing roles of growth and governance quality and the debt-inducing role of conflict.

A number of policy recommendations can be drawn from this study. First, the results emphasize the relevance of economic growth and prosperity in reducing the debt burden or maintaining it at a sustainable level. The challenge of fostering an environment suitable for growth and development is thus one that should be taken by all SSA countries. Second, SSA governments seeking to keep debt under control should strive towards strengthening institutions of governance, increasing the fight against corruption, and ensuring the adherence to the rule of law. The latter two policy conclusions present two very challenging tasks to which there is no straightforward approach in the SSA context. However, a good starting point could be to direct focus on strengthening the institutions of governance which may then help the fight against corruption and the lack of respect for the rule of law often associated with SSA countries. Lastly, given the external debt-inducing role of conflict, it is critically important that SSA's governments give more attention to the task of conflict resolution in order to stem the tide of recurrent conflict in the sub-region.

Chapter 3

Examining the relationship between public debt and growth: the case of sub-Saharan Africa

3.1 Introduction

The poor economic performance of African countries relative to other developing countries during the 1980-1994 period spurred a heated debate in the growth literature. Many researchers attempted to explain this variability in economic growth (Barro & Lee, 1994; Sachs & Warner, 1995; Easterly & Levine, 1997; Collier & Gunning, 1999). It was common among these growth studies to employ a large near-global sample and then include regional dummies to capture the difference between SSA and other regions. The rule of thumb for explaining SSA's poor economic performance was the lack of statistical significance of the African regional dummy which is used to imply the difference between the sub-region and other regions in the standard explanatory variables[14]. Interestingly, the dummy was found to be large and significant in many cases (Barro & Lee, 1994; Easterly & Levine, 1997; Collier & Gunning, 1999), implying that the drivers of economic growth were the same for SSA as for other regions of the world. However, the evidence further showed that some region-specific factors were responsible for the slow growth problem. Collier & Gunning (1999), for example, argued that SSA's poor economic performance relative to other regions was due to the lack of social capital typically reflected by the high incidence of corruption. Supportive arguments have been made from related viewpoints of poor institutions and policies, economic mismanagement, and ethnic fractionalization (Easterly & Levine, 1997; Cohen, 1997).

Although it was widely agreed that the relatively poor growth of SSA countries was due to region-specific factors, the debt overhang problem[15] was at the same time one of the topmost sources of macroeconomic concerns in the sub-region (Elbadawi, Ndulu, & Ndung'u, 1997). Quite unsurprisingly, it was considered as the main macroeconomic determinant of the slow and negative economic performance that was witnessed during the period (Elbadawi, Ndulu, & Ndung'u, 1997; Battaile, Hernández, & Norambuena, 2015). In response to the problem, two debt relief packages were launched: the heavily indebted poor countries (HIPC) initiative in 1996, and the multilateral debt relief initiative (MDRI) in 1999. The centrality of the debt

[14] Standard explanatory variables mostly common to the early growth studies and consistent with the endogenous growth model are investment, degree of openness, financial depth, institutions, human capital and initial income.

[15] Debt overhang refers to the loss of confidence on the part of creditors, in the ability of the debtor country to fully repay its debt (Krugman, 1988).

overhang problem and its effects on economic performance at the time made it a major topic of academic and policy dialogue in the sub-region. (Elbadawi et al., 1997; Ajayi, 1991; Fosu, 1999).

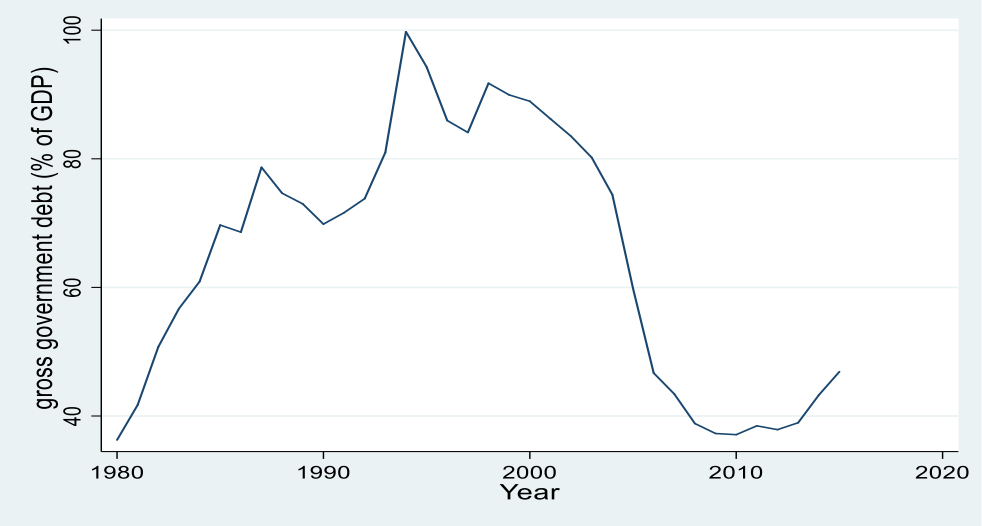
It is interesting that for about two decades beginning in the mid-1990s, that is, following the era of slow growth, the majority of SSA countries have experienced significant economic growth and development. For example, it has been noted that the period between 1990 and 2015 was marked by improvements in human development outcomes in the sub-region (Selassie, 2018). Typical examples of these outcomes are the increases in life expectancy, declines in mortality rates, and the narrowing of the infrastructure gap. Although these have been attributed to improved policies and institutions (IMF, 2019), they have also been credited to the debt relief packages offered to heavily indebted poor countries the majority of which are in SSA (Battaile, Hernández, & Norambuena, 2015; IMF, 2017; Selassie, 2018). Considering that public debt may only be beneficial at reasonably low levels (Pattillo et al., 2002), it can be implied that the era of increasing growth in SSA was a result of debt relief which increased the fiscal space and freed up the much-needed resources in the beneficiary countries of SSA. A troubling reality in recent years, however, is that the episode of increasing growth appears to have been replaced by a slow growth episode beginning in 2015 (see Fig 3-2).

It is even more concerning that the outset of the recent episode of declining growth rates in parts of SSA coincides with the new episode of growing debt in the sub-region which began in the wake of the global financial crisis (GFC). This can be observed by comparing Figures 3-1 and 3-2. Analysts worry that if left unchecked, this new wave of rising debt could bring back the experience of the debt crisis that was witnessed in previous decades (Coulibaly, Gandhi, & Senbet, 2019; Atingi-Ego, 2019). This has reawakened the consciousness of researchers and policymakers *inter alia* to the possible economic consequences of high and rising debt in the sub-region.

There are at least three key concerns that necessitate an examination of the debt-growth nexus in SSA. First, many economically fragile states are already behind on their debt service responsibilities and thus require debt restructuring.[16] Moreover, even in countries where the public debt burden is manageable, debt service obligations have taken a growing percentage of government tax revenues (IMF, 2019). The second concern is about the complex composition of public debt. SSA recorded an increase in public debt of US$366 billion between 2010 and

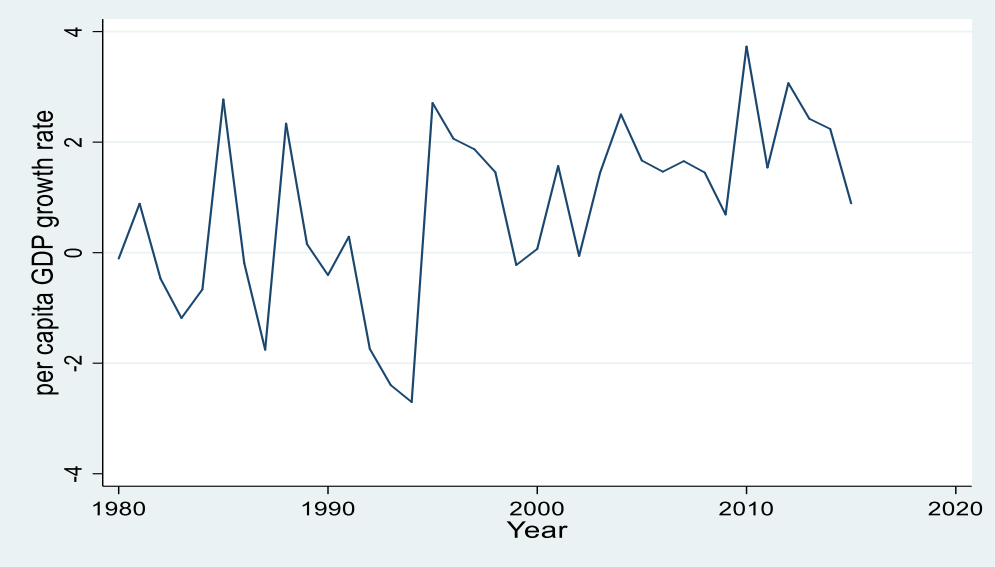
[16] This includes Chad, Mozambique, and Congo Republic.

Figure 3-1. Average gross government debt (% of GDP) in SSA (1980-2015)



Source: Author's compilation using data from the Historical Public Debt Database as compiled by Abbas et al. (2010)

Figure 3-2. Average per capita GDP growth rates in SSA (1980-2015)



Source: Author's compilation using data from World Development Indicators (2020)

2015 (IMF, 2019). For the most part, this amount comprises public debt from private capital markets and from domestic sources, both of which are issued at market rates and are thus susceptible to repricing risks (Olabisi & Stein, 2015). A large part of this debt has been issued in foreign currency (IMF, 2019), making it vulnerable to fluctuations in the exchange rate. The third concern is that the recent discussions have focused mainly on the advanced and emerging countries. Where SSA has been considered, it is usually in a sample comprising developed and developing countries (see for example, (Afonso & Jalles, 2013; Karadam, 2018). However, the focus on the case of SSA is necessary to account for the region-specific determinants of economic performance such as institutional quality and armed conflict as well as shocks to the terms of trade.

As public debt continues to rise in SSA, the need and expectations of a corresponding rise in GDP have also risen alongside. Moreover, there are growing concerns that global conditions may tighten in the near future, which could limit access to credit both in domestic and international private markets (IMF, 2019), leading to the increased cost of credit where available. Given these concerns, this study examines the long-run economic effects of public debt in SSA, particularly as the growing debt problem seems to have a long time horizon (Dombi & Dedák, 2019). Specifically, it examines two widely-debated propositions in the debt-growth literature[17], following the seminal paper by Reinhart & Rogoff (2010). The first is that public debt has a negative long-run relationship with growth and the second is that public debt relates non-linearly with growth in the form of a bell-shape that satisfies the Debt-Laffer curve. In examining these propositions, the study accounts for key empirical issues namely cross-section dependence and heterogeneity which have generally been ignored in previous studies, particularly those focusing on SSA.

3.2 Literature Review

3.2.1 Theoretical Literature

The impact of debt on growth has been the topic of a well-known theoretical debate. Historically, researchers are easily classified as proponents or opponents of the theory of debt neutrality (Barro, 1974),[18] which supposes *inter alia* that individuals have finite lives, live in overlapping generations, and are adherent to the theory of rational expectations. Accordingly, given an increase in public debt, the expectation of a resultant future rise in taxes will make agents respond in the immediate by raising their savings. The implication is that the interest rate will remain unchanged and public debt will have no effect on growth as there will be no crowding out of private capital (Barro, 1974; Buchanan, 1976; Bernheim, 1987). Over the decades, this argument has severely been weakened by the persistent increases in public debt across the globe which have often been associated with negative long-run growth effects (Modigliani, 1961; Diamond, 1965; Panizza & Presbitero, 2013). Researchers now seem to take for granted that public debt has important economic consequences and, therefore, focus on understanding the nature and variabilities of these effects (Cecchetti, Mohanty, & Zampolli,

[17] These propositions which have informed much of the more recent studies in this strand of the literature are drawn from the findings of Reinhart and Rogoff (2010) which suggest that the debt-growth nexus is negative and non-linear.

[18] The debt-neutrality argument is popularly referred to as the Ricardian Equivalence hypothesis, which though attributed to David Ricardo, was extended and popularized by Barro (1974), and thus sometimes called the Ricardo-Barro hypothesis. It simply speaks of the lack of difference between debt and tax finance for any given amount of government expenditure.

2011; Panizza & Presbitero, 2013; Saungweme & Odhiambo, 2018). Nevertheless, the debt-neutrality theory, as it appears, continues to be an important starting point in the analysis of the effects of debt since researchers often begin by assuming a state of the world where the theory does not hold.

The opponents of debt-neutrality are simply of the general view that public debt has positive short-run and negative long-run effects on economic activity (Elmendorf & Mankiw, 1999; Diamond, 1965). This argument is popularly referred to as the conventional or traditional view. The short-run effects are linked to the Keynesian theory and the long-run effects, to the neoclassical theory (Bernheim, 1989). In the Keynesian view, individuals are short-sighted, liquidity-constrained, and have a high propensity to consume current disposable income (Bernheim, 1989). Given these suppositions and coupled with the notion of sticky wages and prices in the short-run, aggregate demand responds positively to a temporary reduction in taxes and the use of debt-finance. This Keynesian stimulation of aggregate demand leads to an overall increase in output in the short run.

According to the long-run neoclassical view where agents are farsighted and have the ability for life-time consumption planning, the fall in public savings created by the rise in deficit is not matched by an increase in private savings since the Ricardian equivalence argument does not hold (Diamond, 1965). As a result, a chain of economic effects is set in motion which ultimately leads to the fall in future gross national output (Bernheim, 1987; Elmendorf & Mankiw, 1999). The standard neoclassical growth model has been the workhorse for the empirical analyses of the effects of debt on economic growth – both in developed and developing countries. The model which is usually augmented with the debt variable of interest is specified such that the growth rate of income per capita depends on the log of initial per capita income, savings, or investment as shares of GDP and population growth among other growth covariates (see, for example, Cecchetti et al., 2011; Checherita-Westphal & Rother, 2012; Panizza & Presbitero, 2014; Afonso & Jalles, 2013). This study also relies on the neoclassical model to explain the debt-growth nexus in SSA.

Theoretical arguments on the effects of debt on growth have mainly been drawn from the experience of developed countries. A related growth model that has been used to explain the effects of debt in the context of developing countries is the Harrod-Domar[19] (H-D) growth model (Eaton, 1992). The H-D model underscores the essential requirements for the achievement and sustenance of long-run steady economic growth. The model emphasizes that

[19] see Harrod (1939); Domar (1946)

economic growth rate depends strongly on net investment which in turn depends on the savings and productivity of capital. In effect, borrowing is beneficial to countries at the early stages of development where investments are expected to have a high rate of return. Public debt is, therefore, given the positive role of fixing the savings gap problem typically experienced in developing countries. Keita (2016) reiterates this by arguing that public borrowing can be used to augment the low levels of domestic savings in order to increase the level of domestic investment, and lead to increases in economic growth. A major criticism of this growth model is its implication for debt sustainability. It seems possible that public debt could grow indefinitely and become a Ponzi scheme where more and more borrowing is needed to service outstanding liabilities (Eaton, 1992).

While the shortage of savings in developing countries makes external borrowing beneficial for growth, there are theoretical arguments that indicate that a large accumulation of public debt may harm growth. In view of SSA countries, these arguments are laid out in the debt overhang theory (Krugman, 1988; Sachs, 1989). Debt overhang refers to the loss of confidence on the part of creditors, in the ability of the debtor country to fully repay its debt (Krugman, 1988). The term is similarly associated with the notion of efficiency losses arising when "current debt far exceeds the present value of expected net debt service payments" (Sachs & Huizinga, 1987 pp592). This had been the experience in many developing countries in previous decades and accounts for the debt relief interventions that were provided to affected countries. An important point that the debt overhang theory raises is that of debt sustainability (Sachs, 1989; D'Erasmo & Mendoza, 2018). The debt-overhang hypothesis is developed in view of countries where the larger proportion of debt is held in foreign currency, as typically obtainable in SSA (Panizza and Presbitero, 2013). It was thus the basis of early empirical studies such as those of Elbadawi et al. (1997).

The debt overhang hypothesis also conceptualizes the non-linear link between debt and growth, since it gives the idea that a high and rising public debt is harmful to the growth process. Moreover, it raises the question of the point at which the debt burden becomes unsustainable (Panizza & Presbitero, 2013). This idea that debt may have a nonlinear growth effect is popularly depicted by the Debt Laffer curve, a derivative of the debt overhang theory. Elbadawi et al. (1997) and Megersa (2015) are two empirical studies focusing on SSA where the Debt Laffer curve was used to analyse the nonlinear effects of debt. Originally, however, the Debt Laffer curve is a concept used to explain the bell-shaped nexus between the nominal debt outstanding and its corresponding market value (Claessens, 1990). It was first introduced by Sachs (1989) through the debt overhang hypothesis. Overall, it is worth noting, that there is

still no unified theory that specifies a magnitude of debt to GDP ratio for all countries beyond which debt becomes unsustainable.

3.2.2 Empirical Literature

The nexus between public debt and economic growth has continued to receive attention from researchers and policymakers around the globe. The upsurge in research interest in this area is a response to the rising trends of public debt in the wake of the GFC. Previous research can be considered in two phases. The first phase is characterized by its focus on developing countries, due to the heavy indebtedness of these countries during the 1980s and 1990s and to the consequent debt crises of that era. The second phase of the literature focuses more on the advanced countries and in some cases, a combination of the advanced and developing countries. The second phase of the literature has emerged in more recent years in response to the seminal paper of Reinhart & Rogoff (2010), which is one of the earliest empirical responses to the growing cases of fiscal imbalance that have been witnessed in many countries in the aftermath of the GFC.

In phase one of the literature which focuses on developing countries, Elbadawi et al. (1997) consider the effects of debt overhang on growth in SSA. Their analysis employs a dataset comprising 99 developing countries over the period 1960-1994. The results from fixed effects and random effects models indicate that public debt is good for economic growth, but that debt overhang which is indicative of high and rising debt has adverse effects on economic growth. Similarly, Ghura & Hadjimichael (1996) focus on the determinants of growth in SSA and show among other things, that growth of per capita income is positively influenced by deficit-reducing public policies. Cohen (1997) discusses the role of external debt crisis in explaining the slow growth of SSA and Latin American countries. Since debt overhang captures the inability of a country to bear its debt service responsibilities, researchers have sometimes considered the separate effects of debt and debt service with both variables usually having deleterious effects on growth (Fosu, 1996; Iyoha, 1999).

Apart from the studies examining the economic effects of debt overhang in African economies within this early phase of the literature, other studies, also published during the period, focused on explaining the low relative growth of SSA countries. Such studies highlight some of the region-specific issues that may explain the relatively poor economic performance of SSA countries. Collier & Gunning (1999), for example, attribute SSA's poor relative economic performance to the low quality of institutions. Although institutional quality has improved in many SSA countries as a result of democratisation, there still exists a large scope for

improvement (IMF, 2019). Easterly & Levine (1997) also provide a strong role for institutions, along with other factors like economic mismanagement and ethnic fractionalization in explaining Africa's low relative growth. Cohen (1997) corroborates these results for both SSA and Latin American countries. Additionally, adverse terms of trade shocks have also been widely associated with the poor economic performance of African economies as a result of the high dependence on commodity exports in these countries (Danso, 1990; Ajayi, 1991; Elbadawi et al., 1997; Melina & Portillo, 2018).

Further to the evidence of a negative effect of debt, studies focusing on SSA examine non-linear relationship between debt and growth, typically through the Debt Laffer curve hypothesis. Elbadawi et al. (1997) and Megersa (2015) employ a quadratic term in their growth regressions to examine the non-linear effect. In both cases, the Debt Laffer curve is confirmed for SSA countries. While Elbadawi et al. (1997) do not lay emphasis on this, they present a threshold estimate of 97% for their sample of developing countries. On the contrary, the focus of Megersa's (2015) study is to verify nonlinearity and to determine the applicable threshold for SSA countries. Interestingly, the study presents a turning point of 45% which would appear to apply to SSA countries given its consistency with the debt sustainability framework of the Barkbu et al. (2008). However, the study employs the pooled OLS estimation method and does not include other more robust panel estimators like the fixed effects which could account for common estimation problems such as country and time fixed effects.

Another important issue that has historically been at the core of Africa's debt problems relates to the composition and maturity structure of public debt. An interesting debate evaluates the optimality of long-term relative to short-term debt given the view that the debt structure of a country may affect its economic performance (Borensztein, Chamon, Jeanne, Mauro, & Zettelmeyer, 2005; Alfaro & Kanczuk, 2007). According to debate, short-term debt is highly susceptible to rollover risks, can induce a debt crisis, and can bring about sharp rises in interest rate (Borensztein et al., 2005; Alesina, Prati, & Tabellini, 1989). Given these possible negative economic effects of short-maturity debt, researchers and policymakers have tended to make the case for lengthening the maturity structure of debt. However, Alfaro & Kanczuk (2007) in a counter-argument caution against the lengthening of debt maturity, arguing that long-maturity debt may only be indicative of the uncertainty regarding the ability and willingness of the government to honour its repayment obligation. From the viewpoint of SSA countries, the over-reliance on short-term and floating rate debt has been associated with debt overhang in the past (Haynes, Parfitt, & Riley, 1987; Danso, 1990; IMF, 2001;). Moreover, it has been observed that the concerns around SSA's borrowing in recent years relate *inter alia* to the growing

dependence on short-term debt, particularly from domestic markets (Atingi-Ego, 2019; Coulibaly et al., 2019). Part of the goal of this study, given the foregoing, is to evaluate the differences in effects between long-term and short-term external debt.

Following the seminal work of Reinhart & Rogoff (2010) which presents a good starting point for the current discussions, the focus has shifted to the advanced and emerging countries (Kumar & Woo, 2010; Cecchetti et al., 2011; Checherita-westphal & Rother, 2012; Égert, 2012; Chudik, Mohaddes, Pesaran, & Raissi, 2017). Earlier, the finding of Reinhart & Rogoff (2010) was highlighted, which indicates that debt ratios above 90%, in general, have adverse effects on growth and that emerging countries even suffer from the negative effects at a much lower ratio (60%). Motivated by these findings, researchers have focused more on verifying the negative long-run effects of debt from the neoclassical view, and on determining the threshold at which this negative effect sets in. It is worth noting that despite the large volume of published studies, the evidence is mixed, and no consensus has been reached. While many studies have presented a negative link (see for example Szabo, 2013; Panizza & Presbitero, 2014; Gomez-Puig & Sosvilla-Rivero, 2017), a substantial number of others have indicated a nonlinear relationship (see for example, Baum, Checherita-westphal, & Rother, 2012; Minea & Parent, 2012).

Beyond the evidence of nonlinearity, Chudik et al. (2017) show that the level of the debt is less important than its trajectory[20]. In some cases, a positive link has been suggested (Abbas & Christensen, 2010; Uzun, Karakoy, Kabadayi, & Emsen, 2012). Moreover, some authors either find that the relationship is not robust (Lof & Malinen, 2014), or that there is no relationship at all (Kourtellos, Stengos, & Tan, 2013; Panizza & Presbitero, 2014). Thus, this strand of the public debt literature is very controversial. Although an increasing number of researchers tend to present evidence of a negative and/or nonlinear effect of debt, the validity of the evidence has been questioned. The issues highlighted are the tendency to ignore key empirical issues such as cross-section dependence and cross-country heterogeneity, and the inadequacy of the approach to dealing with reverse-causality (Panizza & Presbitero, 2013; Eberhardt & Presbitero, 2015; Ahlborn & Schweickert, 2018).

Regarding the first issue of causality, there are two arguments: the first is about the possible problem of reverse-causality, which makes it difficult to identify the causal link between debt and growth.[21] The second argument is about the implicit but albeit restrictive assumption of

[20] Chudik et al. (2017) argue that a country with large amounts of debt may grow as fast as countries will low debt burdens provided that the debt burden takes a downward growing trend.
[21] A very interesting summary of this discussion is presented in Panizza and Presbitero (2013)

cross-section independence in most of the debt-growth literature (Eberhardt & Presbitero, 2015; Banerjee & Carrion-i-silvestre, 2017). Considering the first problem of a reverse-causality, there is the interesting and plausible argument that the widely reported effect of debt on growth could rather be an indication of the effect of growth on debt (Reinhart, Reinhart, & Rogoff, 2012).

To account for this likely source of endogeneity, researchers have considered a variety of econometric procedures including the multivariate panel vector auto-regression (PVAR) technique, and the instrumental variables approach using internal or external instruments. Internal instruments are employed within the popular Arellano-Bover and Blundell-Bond GMM frameworks. Kumar & Woo (2010), Checherita-westphal & Rother (2012), Afonso & Jalles (2013) have, for example, employed the system GMM method. Two key drawbacks with the use of this method have, however, been highlighted. One is that the OLS and GMM estimates are similar as in Kumar & Woo (2010) – which either suggests the absence of endogeneity or the inability of the system GMM to deal with it. The other is the fact that these models, having been developed in view of microdata, are thus poorly suited for macro datasets (Panizza & Presbitero, 2013).

The use of external instruments has also been considered by Panizza & Presbitero (2014) who instrument public debt using the valuation effects caused by the relationship between foreign currency debt and the volatilities in exchange rates. Similarly, Checherita-westphal & Rother (2012) instrument public debt with the average debt ratio of other countries in the sample. Notably, the instrumental variables approach presents a lack of consensus regarding the debt-growth nexus. While some find the usual negative link between debt and growth (Kumar & Woo, 2010; Checherita-westphal & Rother, 2012), others find that the link disappears once an instrumental variable is employed (For example, Panizza & Presbitero, 2014). Lof & Malinen (2014) employ the PVAR method, which fails to present a robust relationship. Overall, one thing that seems quite clear from previous attempts at addressing the possible reverse-causality problem is the inconclusive nature of the evidence.

The second aspect of the causality question deals with the possible effect of cross-section dependence. It has been argued that cross-country macro panels are highly susceptible to the problem of cross-section dependence which could lead to inconsistent estimations (Chudik & Pesaran, 2015; Eberhardt & Presbitero, 2015). Cross-section dependence may be caused by the presence of common shocks and unobserved time-varying components that either affect all groups or subgroups in a panel sample (Pesaran, 2006; Hoyos & Sarafidis, 2006). Typical

examples of observed common factors to which all countries in the sample may respond are the oil shocks of the 1970s and 1980s and more recently, the GFC. SSA countries even in recent times have been affected by global conditions such as movements in commodity prices and climate shocks that constrain agricultural production (IMF, 2019). Pesaran (2006) emphasizes the necessity of testing for cross-section dependence and demonstrates, using Monte Carlo experiments, that estimates could suffer from severe bias and size distortions in the presence of cross-section dependence. Thus, although panel data has an edge over time series or cross-sectional data in that it contains far more information and can thus provide for more precise estimations, the problem of cross-section dependence effectively eliminates this advantage. To use the words of Cameron & Trivedi (2005, p.702), "NT correlated observations have less information than NT independent observations".

Theoretical econometrics presents a variety of panel methods with built-in capabilities to address the problem of common correlations (Pesaran, 2006; Hoechle, 2007; Eberhardt & Teal, 2010). For example, Greene (2018) discusses a procedure for estimating the usual pooled OLS with panel corrections for heteroscedasticity and cross-correlations. Pesaran (2006) presents a heterogeneous method whereby unobserved common correlated effects (CCE) are removed through the inclusion of cross-section averages in the regression. Similarly, Driscoll & Kraay (1998) discuss an approach to estimating the pooled OLS and fixed effects regressions while accounting for heteroscedasticity, autocorrelation, and cross-sectional dependence. Despite these advances in the econometrics literature, it is surprising that researchers examining the debt-growth nexus, have in most cases, ignored the likely problem of cross-correlation (Eberhardt, 2012; Panizza & Presbitero, 2013).

Turning to the heterogeneity problem, some studies have argued that the debt-growth nexus is complex, varies widely from one country or group to another, and can be attributed to unique country-specific factors such as institutional quality, the composition of debt, and history of debt vulnerabilities among others (Reinhart, Rogoff, & Savastano, 2003; Eberhardt & Presbitero, 2015). Under the heterogeneity argument, researchers examine the applicability of the theoretical long-run negative relationship between debt and growth to all countries (Eberhardt & Presbitero, 2015). This is an important question because of the mixture of findings in the literature highlighted earlier.

The heterogeneity argument also applies to the well-known nonlinear nexus between debt and growth. Researchers tend to disagree that a single threshold applies to all countries and often view threshold estimates as being more applicable when estimated at the country level (Panizza

& Presbitero, 2013; Eberhardt & Presbitero, 2015; Chudik et al., 2017). A supporting perspective in this regard is given by Reinhart et al. (2003), who, in their postulation of a *debt-intolerance* hypothesis, argue that many emerging countries are already highly debt-intolerant at debt ratios between 15% and 20%, whereas much higher debt ratios are well within manageable limits in the advanced countries. This argument is supported by recent discussions around the imminent debt crisis in SSA countries. Several countries faced the risk of a debt crisis as of 2018 (IMF, 2019) but at relatively low but varying burdens of external debt. Among these countries, Burundi and Cameroon had debt ratios below 30% between 2010 and 2018 while the debt ratios of Ghana and Zambia ranged from 26-41% and 23-75%, respectively, during the same period (WDI, 2020). Thus, while it may be useful, to employ a large sample that is categorized typically according to income classifications[22], it is likely that, even among SSA countries, cross-country heterogeneities may be present. This study, therefore, focuses on the specific case of SSA countries and takes the heterogeneity issue into consideration.

3.3. Model specification, data, and methods of estimation

3.3.1 Model specification and data

Two issues are of interest in this paper as motivated by the reading of the theoretical and empirical literature. The first concerns the long-run negative effect of debt on growth while the second is about the presence or otherwise of a non-linear relationship between debt and growth. In addressing these issues within the context of SSA, the study takes cognisance of the empirical issues that have been raised (see ***Section 3.2*** for more detail). The framework for the empirical analysis is the neoclassical Solow growth model augmented with the key variable of interest – government debt as a ratio of GDP. In this model, economic growth is expressed as a function of initial income per capita, investment (% of GDP), and the population growth rate. This basic framework is extended to include important control variables that are considered relevant in explaining SSA's economic performance. The model is specified as follows:

$$pkg_{it} = \beta + \beta_1 logpky_{it} + \beta_2 D_{it} + \beta_3 D^2{}_{it} + \beta_4 invest_{it} + \beta_5 popgr_{it} + \beta_6 conflict_{it} + \alpha_7 xconst_{it} + \alpha_8 Z_{it} + \varphi_i + \eta_t + \epsilon_{it} \quad (3.1)$$

where the dependent variable pkg_{it} stands for the growth rate of per capita GDP; φ_i and η_t are the country-specific and time-varying effects, respectively. The basic explanatory variables are the log of initial income per capita ($logpky_{it}$)[23]; gross fixed capital formation as a ratio of GDP

[22] See for example Ahlborn and Schweickert (2018).

[23] this represents the catch-up process under the convergence assumption that a country grows faster, the further away it is from its steady-state (Barro & Sala-i-Martin, 2004)

($invest_{it}$) and population growth ($popgr_{it}$). Following Easterly & Levine (1997) and Collier & Gunning (1999), the model controls for two key determinants of economic growth in SSA; namely armed conflict ($conflict_{it}$), a proxy for ethnic fractionalization, and executive constraints ($xconst_{it}$), a measure of institutional quality. $conflict_{it}$ is a dummy variable which takes on the value of 1 in any given year in which at least 25 battle deaths were recorded during the period 1980-2015 while $xconst_{it}$ is a Polity IV governance indicator which refers to the extent to which the government institutions of checks and balances are effective. It is constructed using a 7-points scale which ranks countries with the highest quality of institutions in the 7th category and countries with the lowest institutions in the 1st category. In the variable Z_{it} we include three other region-specific determinants of economic performance: terms of trade, trade openness, and financial depth.

The index of terms of trade (tot_{it}) is included to reflect the primary-commodity-centric characteristic of the majority of SSA exports (UNDP, 2016; IMF, 2019): a rise in the tot index increases the value of exports or reduces the costs of importations. The model captures the small open economy feature of the sub-region using the share of trade in GDP ($open_{it}$) which is defined as the sum of exports and imports of goods and services. Lastly, it includes, as a measure of financial depth – the ratio of broad money to GDP, (m_{it}) following Easterly & Levine (1997). Table 3-1 presents a summary of the variables including the sources of the data and expected signs on the coefficients.

The variable of interest is the ratio of public debt to GDP (D_{it}). This includes three measures of public debt. The main focus is on government gross debt as a share of GDP ($debt_{it}$) which is obtained from the Historical Public Debt Database (HPDD) as compiled by Abbas, Belhocine, El-Ganainy, & Horton (2011)[24]. The two other measures of public debt, both obtained from the World Development Indicators (WDI) are the long-term external ($exlong_{it}$)[25] and short-term external debt ($exshort_{it}$).[26] To capture the possible non-linear characteristic of public debt, the model includes a quadratic term (D^2) in equation (1) and

[24] Abbas et al (2011) employed a variety of databases and sources in compiling the HPDD. As such there are also a variety of definitions of debt. For example, they use the Abbas and Christensen (2010) database of 144 developing countries where government gross debt is defined as "central government debt".

[25] Short term external debt is defined as debt that is originally issued at a maturity of one year or less. (World Development Indicators)

[26] Long-term external debt is defined as debt that is originally issued at a maturity of more than a year. It comprises public, publicly guaranteed, and private nonguaranteed debt (World Development Indicators)

Table 3-1. Summary of variables and their sources

Variable	Description	Expected sign	Source
pkg	per capita GDP growth	Dep. variable	WDI
log pky	Log of per capita GDP	(-)	WDI
debt	Gross debt as a ratio of GDP	ambiguous	IMF (HPDD)
exlong	Long run external debt/GDP	ambiguous	WDI
exshort	Short-run external debt/GDP	ambiguous	WDI
invest	Gross fixed capital formation/GDP	(+)	WDI
popgr	Population Growth	(+)	WDI
tot	Terms of trade index	(+)	WDI
open	Degree of trade openess	(+)	WDI
m	Broad money/GDP	ambiguous	WDI
conflict	Armed conflict	(-)	UCDP/PRIO
xconst	executive constraints	(+)	Polity IV

Note: WDI stands for World Development Indicators; UCDP/PRIO represents the Upsala Conflict Data Programme and the Peace Research Institute, Oslo; HPDD stands for the Historical Public Debt Database by Abbas et. al. (2010).

follows the testing approach developed by Sasabuchi (1980) and modified by Lind & Mehlum (2010), hereinafter referred to as the SLM test. While the use of a quadratic specification is the most commonly used approach in verifying the presence of non-linearity, previous studies have not followed the SLM testing approach which is generally regarded as the correct approach to the test for nonlinearity. Panizza & Presbitero (2013) highlight this gap in the literature.

The quadratic form of the nonlinearity is consistent with the Debt Laffer curve hypothesis (Sachs, 1989; Claessens, 1990) according to which the debt-growth relationship is predicted to have an inverted-U shape. This implies that debt could be good for growth but only up to a turning point at which the sign of the variable switches to negative to show that further accumulations may have deleterious effects on economic growth. Equations 3-2, 3-3, below are specifications of the SLM approach to testing within some interval whether the relationship between debt and growth is increasing at low values of debt but decreasing at high values of debt. Given equation (3.1), a rejection of the null hypothesis (equation 3.2) in favor of the alternative (equation 3.3) will affirm the validity of a nonlinear (inverted U) relationship:

$$H_0: \beta_2 + 2\beta_3 D_L \leq 0 \text{ and/or } H_0: \beta_2 + 2\beta_3 D_H \geq 0 \quad (3.2)$$

vs.

$$H_1: \beta_2 + 2\beta_3 D_L > 0 \text{ and } H_1: \beta_2 + 2\beta_3 D_H < 0 \quad (3.3)$$

A more direct approach to the non-linearity or threshold question is to consider the growth effects of debt at different levels of debt ratios, by using dummy variables to capture some exogenously determined thresholds. The general motivation for this approach which has quite often been used in previous studies is that a large amount of debt relative to GDP is likely to impact negatively on the growth process. The most commonly used debt thresholds in previous studies as motivated by the approach in Reinhart & Rogoff (2010), are 30%, 60%, and 90%. Kumar & Woo (2010), for example, focus on advanced countries and follow this approach. Afonso & Jalles (2013) also employ this method but with a focus on a large number of advanced and developing countries. Égert (2012) re-examines the findings of Reinhart & Rogoff (2010) using formal econometric methods with a large dataset on advanced and emerging countries and employs these arbitrarily set thresholds, albeit under the framework of formal non-linear threshold models. In these studies, debt is considered to be low at ratios of 30% and below. Medium levels of debt are between 60% and 90%, while high levels are from 90% and above.

Following previous findings that low-income countries may risk a crisis at relatively low debt ratios (Reinhart et al., 2003), this study considers the incremental effects of debt on growth. It employs dummy variables that take the value 1 where the debt burden is: less than 30% (d30), greater than 30% but less than 40% (d3040), and greater than 40% but less or equal to 60% (d4060). Each of these is then interacted with the gross debt ratio, so that each interaction term represents debt at a given interval. For example, interacting debt with d30 effectively measures debt at less than 30% of GDP. The a priori expectation is that a low amount of debt relative to income will have a positive effect while a high amount of debt ratio will have the opposite effect.

The analyses of the debt-growth nexus as carried out in this study is aided by a dataset comprising 24 SSA countries over the yearly period 1980-2015. While the period is determined by the extent of data availability, it also covers the slow-growth era of the 1980s to the mid-1990s, the growth era which began from around the mid-1990s up until around the mid-2010s and the recent slow-growth episode (IMF, 2019). Moreover, the sample includes the largest economies in the sub-region which according to the IMF (2019) are among the resource-rich countries in which much of the recent slow growth episodes have been recorded. Table 3-2 presents the list of countries that we have been included in the sample and shows that over 65% of the sample have experienced conflict during the 1980-2015 period. It also shows that majority of the sample countries (over 70%) are debt-relief beneficiaries. It can be observed

that the ratio of government gross debt to GDP has been above 50% in the majority of the sample countries.

Table 3-2. List of countries and summary statistics on government gross debt (annual data)

Country	Mean	Std Dev	Min	Max
Benin	54.30	21.20	17.24	101.3
Botswana	18.27	7.54	6.44	39.84
Burkina Faso[c] *	36.22	11.97	16.30	61.80
Burundi[c]*	84.344	44.83	19.20	172.7
Cameroon[c]*	47.75	32.56	9.72	114.2
Chad[c]*	42.71	18.78	19.95	83.65
Comoros[c]*	77.05	26.20	18.15	115.9
Congo Republic[c]*	139.62	65.59	22.89	264.4
Cote d'Ivoire[c]*	86.22	24.76	43.36	151.4
Gabon	53.64	25.80	16.93	99.70
Gambia[c]*	103.56	27.94	45.34	156.0
Ghana*	48.67	26.06	5.042	11.95
Kenya[c]	48.73	11.96	25.96	82.09
Madagascar*	90.88	43.62	31.49	172.7
Malawi*	95.42	37.93	36.71	174.3
Mali[c]*	70.66	35.81	18.07	125.2
Mauritius*	52.75	6.66	40.69	71.76
Niger[c]*	56.63	25.66	19.28	109.3
Nigeria[c]	66.68	54.92	7.28	193.7
Rwanda[c]*	50.31	34.77	12.39	119.5
Senegal[c]*	60.39	19.38	21.84	94.42
South Africa[c]	36.40	7.122	23.20	49.78
Togo[c]*	87.35	20.65	49.04	122.5
Zimbabwe	50.13	17.53	20.14	87.96

Note: * denotes countries that benefited from debt relief; the superscript c denotes the countries that have experienced conflict during the duration of the sample (1980-2015)

Following the conventional approach in the debt-growth literature[27], equation (3.1) is estimated using three variants of the dataset (see Table 3-3): the annual observations, the cumulative five-year overlapping averages, and the five-year non-overlapping averages. In addition to filtering out business cycle fluctuations and thus becoming more suitable for the estimation of medium to long-run relationships (see, for example, Cecchetti et al., 2011), the five-year averages of the data also provide for robustness checks and aid comparison of the results. The use of average observations, however, comes at the cost of introducing autocorrelation in the model. However, the study includes techniques of estimation that account for this problem. In particular, the fixed effects model corrects for autocorrelation and heteroscedasticity up to the

[27] See for example, Cecchetti, Mohanty, and Zampolli (2011), Checherita-westphal and Rother (2012) and Afonso and Jalles (2013).

Table 3-3. Descriptive statistics of variables

	pkg	debt	pky	extlong	extshort	invest	popn	open	tot	m	xconst
Annual data											
Mean	0.808	64.92	1,904	50.48	0.058	19.83	2.670	63.15	116.9	25.98	3.492
S.D	5.262	39.97	2,511	36.63	0.075	9.119	1.011	28.25	42.66	16.56	2.191
Min	-47.50	5.042	207.0	0	0	1.931	-6.766	6.320	21.40	6.546	1
Max	37.54	264.4	12,712	270.8	0.494	89.39	8.118	165.65	357.6	151.5	7
Obs.	864	864	864	864	864	864	864	864	864	864	864
5-year overlapping averages											
Mean	0.918	65.42	1936.3	0.508	0.054	19.71	2.644	63.45	116.7	26.81	3.641
S.D	2.714	37.70	2524	0.347	0.072	8.02	0.913	27.03	37.11	16.62	2.025
Min	-8.532	7.92	224.33	0.019	0	2.55	-4.444	10.55	28.68	8.157	1
Max	12.82	232.10	12242	2.182	0.416	71.29	6.280	165.6	305.3	106.9	7
Obs.	840	840	840	840	840	840	840	840	840	840	840
5year-non overlapping averages											
Mean	0.817	62.98	1,947	0.485	0.054	19.933	2.657	63.48	118.5	26.91	3.630
S.D	3.106	37.03	2,554	0.338	0.072	8.36	0.912	27.49	39.61	16.68	2.058
Min	-8.021	8.624	226.4	0.019	2.1e-07	1.515	-4.073	12.88	44.40	6.272	1
Max	11.06	232.1	12,267	1.974	0.405	62.008	5.295	165.6	320.9	106.9	7
Obs.	192	192	192	192	192	192	192	192	192	192	192

Note: Variable names are not given here in full for brevity given the space, but Table 3-1 provides this information.

5th order with the five-year overlapping average observations, and to the 2nd order with the annual and five-year non-overlapping observations. Table 3-3 presents summary statistics for each of these datasets.The average ratio of the gross government debt to GDP is around 65% for the 24 countries in the sample during the period 1980-2015. The large standard deviation (37%) indicates substantial variabilities in the ratio across the countries. It is observed that on average, the sample countries have experienced low economic growth rates during the study period and that the small average value (0.8%) relative to the standard deviation of 5% shows a significant degree of cross-country variabilities in the growth of per capita income as well. This is supported by the wide margin between the minimum and maximum values. As for the composition of long-run and short-term debt, the results show that the average ratio of long-term debt to GDP is larger than that of the short-term debt as a ratio of GDP.

3.3.2 Methods of estimation

The development of the debt-growth literature has uncovered many empirical issues that make it difficult to correctly detect the link between debt and growth. However, the modelling options in the toolkit of the macroeconomic researcher have also increased remarkably due to the advancements in the methodological literature. In trying to reach the research objectives of verifying the negative and/or non-linear relationship between and growth, this study takes into

account, three major empirical issues that researchers have been dealing with, particularly since the seminal work of (Reinhart & Rogoff, 2010). These are the reverse-causality, cross-sectional dependence, and heterogeneity problems. While the reverse-causality issue has been extensively considered in the extant debt-growth literature, those of cross-section dependence and heterogeneity have been largely ignored. To account for the possible reverse-causal relationship, this study follows the popular approach in previous studies[28] to employ the system GMM method on the cumulative five-year non-overlapping averages where the time frame is reduced to 8 periods due to averaging.[29]

Regarding the issue of heterogeneity, researchers on panel data econometrics have extensively discussed the decision "to pool or not to pool," considering that estimation results could be severely biased if the assumption of homogeneity fails to hold (Baltagi, Bresson, & Pirotte, 2008; Pesaran & Zhou, 2017). Being a testable hypothesis, slope homogeneity as commonly assumed, particularly in micro-panels, has many times been rejected (Baltagi, 2005; Pesaran, 2006). The problem is made even more serious with the increasing time dimension of data, as with macro-panels. The debt-growth literature is notable for its mix of evidence. This mixture of evidence has been considered as a tell-tale sign for the presence of heterogeneities in the nexus (Panizza & Presbitero, 2013; Eberhardt & Presbitero, 2015; Ahlborn & Schweickert, 2018). This study employs panel econometric techniques suitable for both the homogeneous and heterogeneous frameworks. The fixed effects method along with the system GMM technique (Arellano & Bover, 1995; Blundell & Bond, 1998) are employed under the assumption of homogenous slopes while the mean group methods (Pesaran & Smith, 1995; Pesaran, 2006) are employed under the heterogeneity assumption.

Turning to the issue of cross-section dependence, it is important to begin by testing for the presence or otherwise of the problem. To do this, the study employs the Lagrange Multiplier (LM) test of Breusch & Pagan (1980) which is developed for panel data with $T > N$ as is the case with our dataset (Hoyos & Sarafidis, 2006). Additionally, the study employs the Pesaran (2006) C-D test for robustness. These results, presented in Table 3B-1 of the Appendix B, lead to the rejection of the null of cross-section independence at the 1% level and thus to the conclusion that the model faces the problem of cross-correlations. Possible candidate causes are the terms of trade shocks arising from the large dependencies of SSA countries on primary

[28] See for example Kumar and Woo (2010) and Checheritta-Westphal and Rother (2012)

[29] As outlined in Arellano & Bover (1995) and detailed out in Blundell & Bond (1998), the system GMM is a micro-panel framework applicable to the large N, small T literature. Although we implement a cross-country macro-panel, the transformation of the annual data into five-year averages effectively turns our data into a format where N>T.

commodity exports[30] and the global financial crisis. It is important to note, however, that cross-correlations can be caused either by "omitted global variables or by common (unobserved) shocks that are correlated with the included regressors" (Pesaran 2006: 968).

To account for the cross-correlation problem, several modelling choices are available, which *inter alia* depend on the nature of the problem. The usual fixed effects model remains consistent but albeit inefficient under the assumption that all countries respond to some common unobserved factors which are themselves uncorrelated with the regressors (Coakley, Fuertes, & Smith, 2006). The lack of efficiency of estimates can, in this case, be dealt with using Driscoll & Kraay (1998) standard errors. Assuming that the regressors are uncorrelated with the disturbance terms, this study, therefore, employs the two-way fixed effects model with the Driscoll-Kraay panel corrected standard errors (Coakley, Fuertes, & Smith, 2006; Hoyos & Sarafidis, 2006).

Assuming that unobserved common shocks that induce cross correlations are not independent of the included regressors (Pesaran, 2006), the fixed effects estimates will in this case be biased and inconsistent (Hoyos & Sarafidis, 2006). Moreover, the use of fixed effects is permissible only under the assumption that the true slopes and variances are the same for all groups. If this homogeneity assumption is violated by the data, the estimates will be biased and inefficient even if the issue of cross-section dependence is dealt with. To account for these possibilities, the study employs the mean group (MG) estimators proposed by Pesaran & Smith (1995) and Pesaran (2006).

The mean group-type estimators have been developed to accommodate the issues of cross-country dependence and heterogeneity. The more basic approach in this regard, developed by Pesaran & Smith, (1995) is the mean group (MG) estimator which deals only with the heterogeneity problem through a group by group estimation and subsequent averaging of the coefficients. The common correlated effects (CCE) method proposed by Pesaran (2006), in addition to accounting for heterogeneity, allows for the consistent estimation of coefficients even in the presence of cross-section dependence. It is referred to as a common factor framework. The main idea behind the CCE approach is to filter out unobserved common factors through the explicit inclusion of cross-sectional averages in the regression. The model also accounts for the possibility that common factors may have differential effects across

[30] Historically, SSA countries have been susceptible to terms of trade shocks due to its large dependence on primary commodity exports. A recent policy report, for example, shows that over two-thirds of SSA countries including Nigeria and South Africa had been vulnerable to terms of trade shocks in 2014 (IMF, 2019).

groups.[31]These cross-sectional averages are included in the regression, but merely to account for the unobserved common factors (Eberhardt & Bond, 2009).

3.4 Results and discussion

This section shifts focus to the presentation and discussion of findings. An important goal is to address the empirical issues of cross-section dependence, reverse-causality, and heterogeneity. The first set of estimations focus on main debt variable of interest – the gross government debt (see Tables 3-4 and 3-5). Thereafter, attention is given to the comparative analysis of long-term and short-term debt account (Table 3-6). In each case, the first set of regressions address the assumption of slope homogeneity and thus employs the two-way fixed effects and the system GMM methods. The fixed effects method corrects for cross-section dependence, heteroscedasticity, and autocorrelation (Hoechle, 2007; Driscoll & Kraay, 1998). Autocorrelation is accounted for up to the 2nd order with the baseline annual and the five-year non-overlapping average observations, and to the 5th order when using the 5-year over-lapping averages. The system GMM method accounts for the possible reverse-causality problem. The second set of results are from the mean group and common correlated effects estimations used to address the issue of heterogeneity as well as cross-section dependence. Employing different estimation techniques facilitates the robustness of results.

Given the possibility of a linear relationship between debt and growth, a linear regression is initially considered. The results, presented in Table 3B-2 of the Appendix, indicate that the debt variable of interest (gross debt ratio) is not significant in the regressions. Interestingly, this result is robust to the variety of estimation methods and variants of the dataset. Whereas similar findings are reported for long-term external debt, short-term external debt is only significant in the linear model (compare Table 3-6 below and Table 3B-3 of the appendix). Given these results, a non-linear model is estimated for gross debt and long-term debt, while short-term debt is only considered in the linear form.

Table 3-4 reports the estimation results for the baseline gross debt regression. In all cases, the results present a negative and significant coefficient on the squared term of gross debt which seems to indicate the presence of a hump-shaped relationship between debt and growth. However, as detailed out in Lind & Mehlum (2010), this result is necessary but not sufficient for nonlinearity, as it could be spurious in cases where the slopes at the limits are either nearly flat and/or where the inflection points lean very close to the endpoints of the data. The SLM

[31] A detailed discussion and application of the CCE method can be found in Coakley, Fuertes, and Smith (2005) and Pesaran (2006).

Table 3-4. Fixed effects and system results

	Fixed effects			System GMM	Mean group estimators	
	1	2	3	4	5	6
Independent variables						
log gdp per capita	-6.067***	-2.568***	-1.260	-1.559	- 4.284**	-5.122***
	(1.759)	(0.874)	(0.766)	(1.708)	(1.962)	(1.082)
govt debt/gdp	0.049***	0.035***	0.035***	0.414***	0.149*	0.158**
	(0.015)	(0.010)	(0.011)	(0.135)	(0.081)	(0.080)
govt debt squared	-0.000**	-0.000***	-0.000***	-0.002***	-0.002**	-0.002**
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Investment (% gdp)	-0.035	0.003	0.017	-0.096	0.037	0.055
	(0.041)	(0.035)	(0.032)	(0.122)	(0.069)	(0.119)
population growth	0.093	0.077	0.575	0.668	0.409	0.328
	(0.420)	(0.126)	(0.529)	(0.881)	(0.417)	(0.227)
terms of trade	0.012*	0.013***	0.010	0.010	0.017	0.017
	(0.006)	(0.004)	(0.007)	(0.015)	(0.022)	(0.027)
trade/gdp	0.043***	0.024**	0.034	0.304**	0.073*	0.035
	(0.015)	(0.009)	(0.021)	(0.135)	(0.041)	(0.031)
broad money/gdp	-0.046	-0.090***	-0.085**	-0.147*	-0.006*	
	(0.039)	(0.024)	(0.032)	(0.077)	(.003)	
conflict	-0.442	-0.536	0.125	3.943**	-0.163	-0.135
	(0.546)	(0.329)	(0.447)	(1.639)	(0.151)	(0.127)
exec const	0.348***	0.331***	0.236	0.856	0.214	0.342
	(0.114)	(0.100)	(0.182)	(0.684)	(0.413)	(0.422)
constant	30.42***	16.13**	-1.596	-20.35	6.182***	3.933
	(9.971)	(6.510)	(8.842)	(12.17)	(0.542)	(2.722)
R-squared	0.20	0.36	0.30			
A-B test				0.68		
p-value				[0.49]		
Hansen test				14.020		
p-value				[0.232]		
No of obs.	824	816	192	192	848	

Note: *, **, and *** denote significance at 10%, 5% and 1% respectively. Standard errors in parenthesis. A-B test stands for the Arellano-Bond test for second-order serial correlation. Hansen test is the test for overidentifying restrictions which allows us to determine the validity of the internal instruments. Columns 1-3 are from the fixed effects estimation with annual data, and the 5-years overlapping and non-overlapping averages, respectively; column 4 presents the system GMM which employs the 5-year non-overlapping averages; Columns 5 and 6 are from the mean group and common correlated effects regressions, respectively.

test thus verifies whether the hypothesized relationship is increasing at low values but decreasing at high values or *vice versa*. It does this by providing for the separate tests of significance for the slope coefficients at low and high values within the data range. The results of the SLM test are presented in Table 3B-4 of the Appendix. Both the extreme point and the 90% Fieller intervals lie within the data range. The overall test statistic is significant in all the regressions, leading to the rejection of the null hypothesis of U-shape in favour of the alternative of an inverted U-shape. This tends to imply that the debt-growth nexus is non-linear and has the form of a hump-shape for SSA countries, thus affirming the argument that public

debt may be beneficial, at reasonably low levels, but harmful when accumulated in large amounts (Pattillo et al., 2002).

The turning point of gross debt, however, seems to vary with the method of estimation consistent with the extant literature. On one hand, the fixed effects regressions present a threshold estimate ranging from 108-131%, while the system GMM method gives an estimate of 92%. On the other hand, the mean group and common correlated effects regressions present much lower threshold estimates of 40% and 41% respectively. Previous studies focusing on developing countries such as Elbadawi et al. (1997) and Karadam (2018) have found the threshold of 97% and 88% respectively, similar to the fixed effects and system GMM estimates. On the contrary, Megersa (2015), focusing on SSA countries, presents a much smaller threshold, quite similar to those of the mean group and common correlated effects estimates in Table 3B-4. Whereas lower estimates would seem more realistic given the generally low debt-carrying capacity of SSA countries, the main highlight here is that the turning point tends to vary from one study or estimation strategy to another.

The next stage of analyses involves the more direct approach to the threshold question. Here, the study employs interaction terms[32] that capture some exogenous debt-to-GDP thresholds. The growth equation is then re-estimated with each of the interaction terms, along with the debt variable and the usual control variables. Table 3-5 presents the findings from the fixed effects, system GMM, and mean group estimations.The interaction terms that capture debt ratios below 30% present a positive coefficient across all the regressions but are mostly insignificant except in the fixed effects regression. As for public debt in the interval of 30-40% the coefficients are all negative and mostly significant at the relevant alpha levels across all the regressions. Public debt between 40-60%, presents a mix of signs but the coefficients are not significant. Overall, the results seem to reflect the low debt-carrying capacities of SSA countries (Reinhart et al., 2003). Moreover, as previous research suggests a country-by-country analysis of threshold effects will enhance the representativeness of estimates (Panizza & Presbitero, 2013; Gomez-Puig & Sosvilla-Rivero, 2017; Ahlborn & Schweickert, 2018).

[32] A dummy variable takes the value 1 if the debt ratio is $< 30\%$, $30 < debt < 40\%$, $40 \leq debt \leq 60\%$. When interacted with gross debt ratio, each of these captures public debt in the corresponding range.

Table 3-5. Growth equation with varying levels of public debt-to-GDP ratios

	Fixed effect	System GMM	Mean group	Common correlated effects
Independent variables				
debt	0.012**	0.028	0.009	0.008
	(0.005)	(.0102)	(0.014)	(0.029)
d30×debt	0.018**	0.028	0.028*	0.034
	(0.007)	(0.017)	(0.017)	(0.235)
R-squared	0.98			
obs.	848	192	848	848
debt	-0.016***	-0.018**	0.032	0.024
	(0.003)	(0.079)	(0.134)	(0.031)
d3040×debt	-0.022**	-0.040	-0.026**	-0.041**
	(0.008)	(0.177)	(0.012)	(0.020)
R-squared	0.94			
Obs.	848	192	848	848
Debt	-0.013***	-0.098	-0.011	0.015***
	(0.003)	(0.088)	(0.017)	(0.044)
d4060×debt	0.027	-0.038	-0.023	-0.049
	(0.032)	(0.151)	(0.053)	(0.235)
R-squared	0.94			
Obs.	848	192	192	848

Notes: *, **, & *** denote significance at 10%, 5% and 1% respectively. Standard errors in parenthesis; for the fixed effects regressions, the Driscoll and Kraay robust standard errors are employed; The fixed effects and mean group regressions employ the baseline annual data while the system GMM employs the five-years non-overlapping averages. Each equation includes the usual explanatory variables but these are not reported for brevity.

Regarding the composition of external debt, Table 3-6 presents some interesting results. The long-term debt-growth nexus is very similar to that of gross debt discussed hitherto. This relationship is also confirmed by the SLM test (Appendix B Table 3B-5). Also similar to the gross debt regressions, the SLM test presents variabilities in the threshold estimates. Whereas the fixed effects regression gives an estimate of 102%, the mean group method again gives a smaller estimate of about 61%. As earlier noted, while the long-term debt-growth nexus exhibits nonlinearity, short-term debt presents a linear negative link (Table 3-6).

To ensure that the coefficients on long-term and short-term debt are statistically different, an estimation is carried out where both variables are included in a linear specification. As presented in Table 3B-6 of the Appendix B, the results show that long-term debt is positive while short-term debt is negative, confirming the initial result. A Wald test of equality between the coefficients on long-term and short-term debt indicates, overall, that the estimates are jointly different from zero.

Aside the effects of public debt, it is important to observe that the selected regressors have the expected sign in most of the estimations and are also significant in many cases. In particular, the evidence shows that the log of initial income per capita has the expected negative sign and

Table 3-6. Fixed effects and system GMM results for long-term and short-term debt

	Long-term external debt				Short-term external debt			
	fe	sgmm	mg	cce	fe2	sgmm2	mg2	cce2
Independent variables								
log pky	-6.305***	-5.122***	11.64***	-6.119***	4.012**	0.109	-4.376***	-4.741***
	(1.833)	(1.082)	(4.247)	0.380	(1.649)	(0.605)	(0.960)	(0.932)
exlong	0.037**	0.152**	0.055	(0.313)				
	(0.014)	(0.061)	(0.063)	-0.005				
exlsq	-0.000**	-0.001**	-0.002**	(0.004)				
	(0.000)	(0.000)	(0.001)	0.380				
exshort					-0.635**	-0.665**	-0.354	-0.288*
					(0.240)	(0.263)	(1.057)	(0.171)
invest	-0.023	-0.007	0.050	0.168	-0.020	0.011	-0.056	-0.012
	(0.043)	(0.056)	(0.082)	(0.180)	(0.032)	(0.000)	(0.087)	(0.122)
popgr	0.048	0.561	1.233	-3.347	0.156	-0.780***	-0.561	0.394
	(0.416)	(0.737)	(2.437)	(4.652)	(0.441)	(0.246)	(0.424)	(0.340)
tot	0.011*	-0.007	-0.027	0.076**	-0.007	-0.009	0.021	0.019
	(0.006)	(0.007)	(0.020)	(0.036)	(0.008)	(0.007)	(0.022)	(0.029)
open	0.038**	0.114**	0.125*	-0.026	0.032	-0.026	0.131**	0.096*
	(0.014)	(0.053)	(0.068)	(0.076)	(0.024)	(0.057)	(0.057)	(0.051)
m	-0.053	-0.047	-0.155	0.217	-0.12***	0.007	-0.261	-0.139
	(0.041)	(0.039)	(0.114)	(0.297)	(0.027)	(0.038)	(0.123)	(0.150)
conflict	-0.457	1.985*	0.320	-0.595	-1.217**	1.054	0.312	-0.393*
	(0.573)	(1.016)	(0.635)	(0.463)	(0.477)	(1.121)	(0.341)	(0.231)
xconst	0.430***	0.602*	1.381*	-0.052	0.101	-0.053	0.123	0.111
	(0.114)	(0.297)	(0.770)	(0.661)	(0.111)	(0.145)	(0.374)	(0.128)
constant	6.182***	-6.919	5.532***	2.625	-6.224	-1.426	3.741***	3.128
	(0.542)	(5.050)	(0.114)	(2.177)	(3.971)	(2.450)	(0.020)	(3.813)
R-sq.	0.19				0.15			
A-B test		-0.72				-1.44		
(p-val)		0.49				0.15		
Hansen		16.04				5.75		
(p-val)		0.15				0.22		
Obs.	834	190	834	843	848	192	848	848

Note: *, **, and *** denote significance at 10%, 5%, and 1% respectively. Standard errors in parenthesis; fixed effects regressions employ the Driscoll and Kraay standard errors; A-B test stands for the Arellano-Bond test for second-order autocorrelation. Hansen test is the test for overidentifying restrictions used in determining the validity of internal instruments; fe and fe2 represent the fixed effects estimation using the annual data; sgmm denotes the system GMM regression which employs which employs the 5-years non-overalapping data where N=24 and T=8; the mg and cce are the mean group and common correlated effects regression, respectively, which employ annual data.

is often significant, confirming the role of initial income in the sample. This effect has often been verified in previous studies (see, for example, Afonso & Jalles, 2013; Cecchetti et al., 2011). Similarly, trade openness and terms of trade have their expected signs and are significant in most regressions. Although armed conflict and institutional quality have the expected signs

in most cases, their significance seems to vary with the measure of debt used. In Table 3-4 where the government gross debt is considered, for example, the results show that the variables are mostly insignificant. On the contrary, in Table 3-6 where the focus is on the long-term and short-term external debt, both variables are significant in nearly 40% of the regressions.

3.5 Conclusion and policy recommendations

This study contributes to the long-standing and ongoing debate on the nexus between debt and growth. It approached the debate from the viewpoint of SSA countries which have mostly been ignored in recent discussions. With the focus on SSA countries, the study accounts for some region-specific factors like the quality of institutions, conflict and terms of trade shocks. The study examines two two widely debated propositions in the public debt literature, the first being that debt has a negative long-run relationship with growth, and the second, that debt relates nonlinearly with growth in the form of a bell-shape that satisfies the Debt-Laffer curve. In an attempt to verify these propositions from the perspective of SSA countries, the study accounts for the key empirical issues that have been raised in the literature namely cross-section dependence, heterogeneity and reverse-causality.

A variety of estimation techniques are employed in view of the empirical issues raised. The fixed-effects technique assumes that the slopes are homogenous, while the mean group techniques, assume that there exist cross-country heterogeneities in the nexus. Both methods also account for cross-sectional dependence which is found to be a problem in the sample. Reverse causality is taken into account using the system GMM approach. In general, the results are robust to the variations in estimation techniques. This is particularly true for the regressions that examine the effects of gross government debt. The results are also robust to variations in the dataset, namely the baseline and five-year average observations.

A number of interesting findings have been made from the study. First and foremost, the study affirms the presence of a Debt Laffer curve for SSA countries. This result applies to both government gross debt and long-term external debt The implication is that although debt may be beneficial for growth at reasonably low levels, large accumulations of debt could be harmful for long-term growth. Despite the evidence of a non-linear link between debt and growth, the study shows that the threshold estimates vary substantially across the various techniques of estimation, and the variants of the dataset. The estimates also fail in most cases to mirror the public debt threshold for low-income countries given the low debt-carrying capacity. Further investigation using interaction terms show that debt ratios above the 30% but less than 40% have a negative and often significant effect. While these results give support to the low debt-

carrying capacity of SSA countries, they lead to the conclusion that the estimation of debt thresholds is likely to be more representative when examined on a country-by-country basis. This is because doing this will allow the researcher to account for the specificities of economic performance at the country level.

Another interesting outcome of this study relates to the difference between long-term debt and short-term debt. On one hand, the findings suggest that long-term debt has a relationship similar to that of our main debt variable of interest – gross debt. That is, long-term debt is only deleterious to growth at high amounts and this evidence of nonlinearity has also been supported by the SLM test. On the other hand, short-term debt presents a linear negative relationship with growth. The cost-saving characteristic of short-term relative to long-term debt often creates the tendency for governments to over-rely on the former source of debt finance. Striking a balance in the structure and components of public borrowing is therefore required to prevent the debt burden from snowballing out of control. Although excessive short-term borrowing has historically been associated with the tendency to induce a debt crisis, it may be imprudent for public debt management to over-rely on any type or source of public debt finance just because it is more cheaply available. The analysis of the previous debt crises in African countries, was traceable, among other things, to the enticement of SSA governments by the cheap availability of credit, often at floating rates. Debt sustainability in SSA countries therefore requires an approach that tries to strike a balance between long and short-term debt.

Chapter 4

Determinants and economic effects of public debt in sub-Saharan African countries: Evidence from Nigeria

4.1 Introduction

The public debt empirical literature is predominantly made up of cross-country panel studies on both the causes and effects of debt. One of the main findings driving the current discussions is that the results from cross-country panels may not apply to individual countries due to the influence of country-specific factors that may not be well captured in a panel framework. In the literature on the determinants of debt, researchers have been puzzled by the cross-country differences in the build-up of debt. This led to the extension of Barro's (1979) model to account for socio-political and institutional factors. In this vein, Oatley (2010), for example, finds that some developing countries were more heavily indebted than others during the late 1990s because of the differences in political regimes. In their model, autocratic regimes have a higher tendency to borrow from foreign sources than democratic regimes, often for purposes other than the need to invest in the provision of public goods. Similarly, there is a considerable amount of evidence to support the role of governance quality in explaining the differences in public debt burdens across countries (see, for example, Alesina & Perotti, 1999; Alesina, Hausmann, Hommes, & Stein, 1999; Woo, 2003). Because of this, there is a tendency for each country's public debt to respond uniquely to different underlying factors (Ajayi, 1991; Panizza & Presbitero, 2013; Ahlborn & Schweickert, 2018).

Regarding the effects of debt on growth, a key part of the debate similarly highlights the issue of cross-country heterogeneities implying that the effects of debt on growth vary widely from one country to another. These variabilities have also been attributed to country-specific factors such as the quality of institutions and the unique macroeconomic environment, *inter alia* (Reinhart, Rogoff, & Savastano, 2003; Panizza & Presbitero, 2013). The heterogeneity issue is most strongly emphasized in the discussion of the threshold effects of debt, under the argument that an estimated threshold of the debt burden may not apply to all countries. As the evidence suggests, while the effects of debt differ between the advanced and developing countries, there are differences even among developing countries (Reinhart, Rogoff, & Savastano, 2003; Reinhart & Rogoff, 2010; Ahlborn & Schweickert, 2018). This is likely to be one of the reasons why a consensus has not been reached despite the large volume of published studies in the literature (Panizza & Presbitero, 2013; Eberhardt & Presbitero, 2015).

Against the foregoing background, this study examines the determinants and economic effects of public debt in Nigeria. The key motivation for pursuing this approach is to see if the results from a country case study are comparable to those from a panel study. There are several reasons that justify the focus on Nigeria. First, it is the most populated SSA country. With a population of over 200 million people as of 2019 (WDI, 2020), the country represents a substantial part of SSA in its entirety. Second, the country's public debt history typifies that of SSA countries, in terms of magnitude, structure and composition. As of 2005 prior to the debt relief interventions, Nigeria's public external debt stood at US$36 billion, making it one of SSA's most heavily indebted countries[33] (Ajayi, 1991; Ogunyemis, 2011). Moreover, there is an increasing tendency to borrow from the international private capital markets as well as from the domestic financial market, both of which have led to increases in the external and internal debt in recent years (Olabisi & Stein, 2015). Given the foregoing, the evidence from this study is likely to be applicable to other SSA countries.

This chapter contributes to the existing literature in three unique ways. First, in addition to the economic determinants of debt, it also examines the role of socio-political factors. Second, it addresses a limitation of existing empirical literature, that tends to focus more on external debt by considering total public debt, which includes both internal and external debt. While the external and domestic components of public debt have been substantial in the case of Nigeria, domestic debt takes the larger share of public debt in many of the years between 1970 and 2018. The exceptions are the years 1986-2004 when external debt constituted the larger share and during which time the country was facing an external debt crisis. This suggests that a representative analysis of Nigeria' public debt should consider both the external and domestic components. The third contribution of this study is in the approach to the analysis of the debt-growth nexus in Nigeria. Most studies on Nigeria have assumed a linear relationship, but the country's previous debt crisis shows that this is very unlikely. This study, therefore, contributes by examining the non-linear relationship between debt and growth in Nigeria. Empirical analyses are aided by two separate annual datasets, one for the determinants and the other for the debt-growth relationship, each of which spans 1970-2017. In both cases, data are analysed using the framework of the autoregressive distributed lag (ARDL) approach to cointegration.

The rest of the chapter is organised as follows: Section 4.2 presents an overview of the development of public debt in Nigeria. Section 4.3 focuses on the review of the literature which is done in two sub-sections. Sub-section 4.3.1 addresses the determinants of public debt while

[33] Ogunyemi (2011) further notes that Nigeria's debt position as of 2005 made it one of the world's most heavily indebted countries.

Section 4.3.2 focuses on the growth effects. Then Section 4.4 specifies the model and provides details about the data and estimation methods. It is also done in two sub-sections: sub-section 4.4.1 focuses on the determinants of public debt while sub-section 4.4.2 deals with the debt-growth effects. Section 4.5 then discusses the methods of estimation while Section 4.6 presents and analyses the results. The final section concludes the paper and provides policy recommendations.

4.2 The evolution of public debt in Nigeria: An overview

It is difficult, if not impossible, to present an overview of the evolution of public debt in Nigeria without considering the structure, history, and politics of the economy (Ajayi, 1991). Before crude oil was discovered in commercial quantities, Nigeria was an agrarian economy that earned most of its foreign exchange from the exports of primary commodities such as cotton, cocoa, groundnut, and rubber (Edo & Ikelegbe, 2014). The 1960s, however, saw a steady decline in the contribution of agriculture to GDP until the earnings from crude oil and gas became the main driver of economic growth, effective from the 1970s. During this period, the significance of oil relative to other sectors increased considerably as oil production expanded in leaps and bounds. By 1971, when Nigeria became a member of the organization of petroleum exporting countries (OPEC), crude oil production had grown to 1.5 million barrels per day (b/d) from only around 5000 b/d in 1958 (Edo & Ikelegbe, 2014). Government spending began to be driven predominantly by the revenues from crude oil. However, the oil boom of the 1970s, followed by the sharp burst of the 1980s soon made it clear that the over-reliance on oil revenues would not be sustainable for economic growth and for fiscal policy.

On the aspects of governance and politics, most of the years between 1960 and 1999 were years of military rule. Notably, this period was marked by political instability, economic mismanagement and poor quality of governance (Babawale, Fadahunsi, Momoh, & Olukoshi, 1996; Edo & Ikelegbe, 2014). Within this era, attempts made to initiate a return to democratic governance were without success. The exception was when General Olusegun Obasanjo successfully turned over the reins of government to the civilian President Shehu Shagari in October 1979. This democratic regime, however, ended abruptly with the return to military rule in 1984. Analysts have commonly associated the poor handling of fiscal policy during this era with the country's external debt problems. (Taiwo, 1988; Ogunyemi, 2011; Edo & Ikelegbe, 2014).

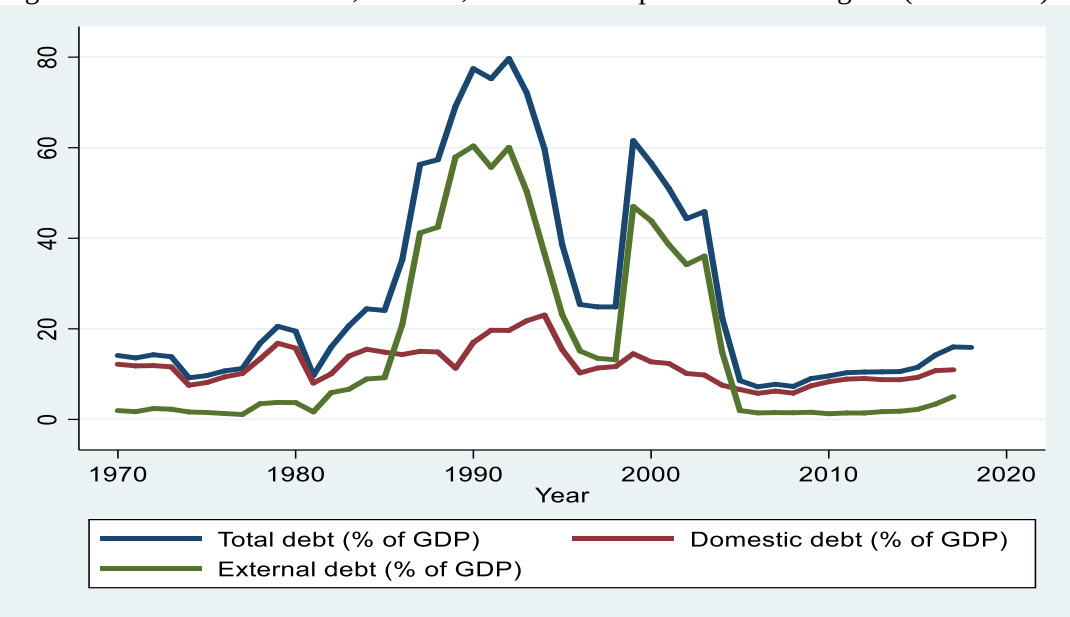
The 1970s' windfall in oil revenues improved Nigeria's creditworthiness as a result of which cheap external loans were accessible from the international capital market. During this time,

the government initiated large and expensive infrastructural projects. As a result, the public debt increased, with a corresponding increase in the debt service obligation, which became a major macroeconomic concern when the adverse oil price shocks of the 1980s hit. (Krumm, 1985; Looney, 1987; Greene, 1989; Ogunyemi, 2011). It is in this vein that Nigeria's previous debt crises have been traced to the overambitious projects that were initiated by the government during the era of the oil boom (Ajayi, 1991; World Bank, 1994; Ogunyemi, 2011).

Analysts tend to disagree on the origin of Nigeria's debt crises. As mentioned earlier, many authors tend to trace it back to the 1980s when the nation witnessed an economic crisis following a shift in focus from agriculture to crude oil and gas as the mainstay of the economy (Singer & Soumitra, 1989; Fajana, 1993). Others argue that the origin of the crisis predates even the country's independence and goes back to the colonial era (Ajayi, 1991; Ogunyemi, 2008; 2011). In particular, Ajayi (1991) associates the problem with both the politics of Nigeria's development and the structural problems that the nation evolved with from the colonial era. In any case, one thing that can be garnered from historical evidence is that government expenditure responded vigorously to the oil boom which brought about sharp increases in government revenues during the decade of the 1970s. Evidence continually points to the persistence of budget deficits as a result of the habits formed around government spending (Taiwo, 1988; 1989, Ajayi, 1991; Jibir & Aluthge, 2019). In particular, Taiwo (1989) shows that government expenditure maintained an upward trend even in periods of dwindling revenue. Ajayi (1991) also notes that government borrowing was often used either to support consumption or other non-viable spending which threw doubts on the ability to repay. Additionally, the author notes that the government also undertook ultra-large projects that often had no guaranteed future streams of income.

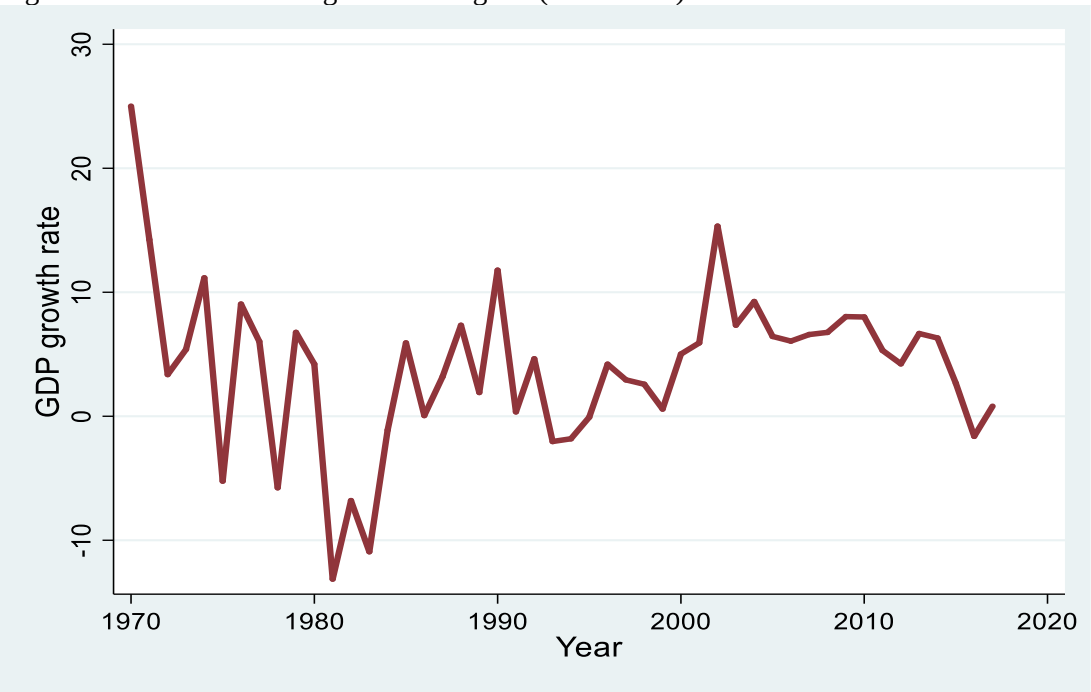
The year 2005 is notable in Nigeria's public finance history. The debt relief deal that was signed in that year marked the country's freedom from its obligation to the Paris Club (DMO, 2006). As a result, external debt was brought down from about $36 billion in December of 2005 to about $3.5 billion in December of 2006 (DMO, 2006). As Figure 4-1 shows, however, public debt has been on a steady rise in the years following this historic debt relief intervention.

Figure 4-1. Trends in the total, external, and domestic public debt in Nigeria (1970-2018)



Source: Author's computation using the Central Bank of Nigeria Statistics Database and Statistical Bulletins for years 2005-2018.

Figure 4-2. Trends in GDP growth in Nigeria (1970-2018)



Source: Author's computation using World Development Indicators (WDI) (2020)

An overview of Nigeria's public debt will not be complete without a highlight of some of the macroeconomic challenges that have commonly been associated with the build-up of the debt. One of the most obvious aspects of the debt problem was the increased debt service obligation that it brought about (Edo, 2002). But the effect of Nigeria's public debt can also be considered from the viewpoint of the declines in economic growth. Negative growth rates were recurrently witnessed between 1981 and 1995 (see Figure 4-2). Although this has been attributed to the oil

glut that hit the global oil market during the 1980s, the period was also notable for the unsustainable build-up of public liabilities (Edo & Ikelegbe, 2014). Further to this, there were remarkable declines in living standards and increases in poverty levels around the country (World Bank, 1994). Overall, for SSA countries in general, and for Nigeria in particular, there were claims made about the adverse growth effects of public debt, typically attributed to the rising debt repayment obligations amidst dwindling revenues (Ajayi, 1991; Edo, 2002).

4.3 Literature review

4.3.1 Determinants of public debt in Nigeria

Theoretically, public debt has been attributed, first to purely economic factors such as growth, government size, and inflation, (Barro, 1979; Lucas & Stokey, 1983; Kirchgassner, 2001), and then to socio-political factors such as the quality of governance (Alesina & Perotti, 1995; 1996) and regime (Olson, 1993; Oatley, 2010). Given the debt crisis of previous decades in SSA countries, researchers have given various attempts at empirically characterising the problem and determining its causes. Thus, a large literature exists on the determinants of deficits and debt, the majority of which are cross-country studies employing panel data methods[34]. A very limited number of country case studies have been published in general, and this is particularly so for the case of Nigeria.

Ajayi (1991) published his study in the heat of the economic crisis that picked up steam in the 1980s following the oil glut of the decade and presents an interesting way of thinking about Nigeria's public debt problem. According to the study, the determinants of public debt are either internal or external in nature. External factors tend to lie outside the control of the debtor country, while internal factors are under the country's control and are thus of particular consideration in determining debt sustainability (Danso, 1990). Factors like oil price shocks, the global interest rate[35], and the growth rate of the advanced countries[36] have been classified as external, while fiscal deficits and government spending are classified as internal factors. The more recent studies such as Edo (2002), Abdullahi, Bakar, & Hassan (2015) and Adamu & Rasiah (2016) tend to follow this approach in explaining Nigeria's public debt.

[34] See Barro (1979) and Lucas & Stokey (1983) for the discussion of the tax smoothing model which emphasises the role of economic factors. For the political-economy approach to budget deficits and debt see Buchanan & Wagner (1976) Persson & Svensson (1989); Alesina & Tabellini (1990). Further, Alesina and Perotti (1995) and Alesina & Passalacqua (2016) provide a comprehensive review of the literature. Empirical studies include Woo (2003), Colombo (2009) Oatley (2010), Abbas et al., 2014; Akitoby, Komatsuzaki, & Binder, 2014) Bittencourt (2015) and Dunne, Nikolaidou, & Chiminya (2018).

[35] This is because of the increased issuance of commercial and floating rate debt

[36] The argument here is that the growth rate of the advanced countries can lead to improvements in Nigeria's terms of trade through increases in demand for oil and other primary commodities' exports

Given that external factors are not country-specific, they may, in general, account for the previous debt crisis in the generality of SSA countries. Internal factors on the other hand are the country-specific factors that have recurred in the literature. For example, although Taiwo (1988; 1989) does not directly aim at discussing the determinants of debt, his studies characterise the nature of public expenditure in Nigeria and indicate that government consumption is strongly influenced by previous habits and thus demonstrates persistence. Similarly, Ogunyemi (2011) presents a historical perspective to Nigeria's public debt problem, emphasizing the effects of ambitious government spending and persistent budget deficits. Also, Nyatepe-Coo (1993) highlights the role of fiscal restraint in the avoidance of debt crisis in Nigeria. Beside the economic factors, a number of internal factors are socio-political and institutional in nature and may also play a role in explaining public debt in Nigeria.

The inadequacy of Barro's (1979) model in explaining cross-country differences in the accumulation of debt has led researchers to explore possible socio-political factors[37]. It turns out that these factors have been found useful in explaining why some countries are more heavily indebted than others. Some of the relevant socio-political factors for developing countries in general, and SSA countries, in particular, are institutional or governance quality (Woo, 2003; Alesina et al., 1999), system of government (Olson, 1993; Oatley, 2010), social polarization, and the related factor of armed conflict (Woo, 2003; Dunne, Nikolaidou, & Chiminya, 2018).

While the role of socio-political factors has been omitted in the empirical analyses of Nigeria's debt, many researchers have acknowledged the influence of these factors. First and foremost, on governance quality, the role of economic mismanagement and corruption have been mentioned over and again as key factors in the previous crisis (Ajayi, 1991; World Bank, 1994; Nyatepe-Coo, 1993; Okonjo-Iweala, Soludo, and Murtar, 2003; Edo & Ikelegbe, 2014). Also, it is important to point out that in the general literature focusing on developing countries, a considerable amount of evidence is presented in support of the role of institutional or governance quality (Alesina et al., 1999; Woo, 2003; Colombo & Longoni, 2009). It is, therefore, important to go beyond a mere acknowledgement of these factors to carry out formal empirical analyses.

There is also the regime-type argument, which might plausibly explain Nigeria's public debt. Since independence in 1960, the country's government has alternated between autocratic (i.e., military) and democratic regimes. Theory and evidence tend to support the argument that

[37] Alesina & Perotti (1995) and Alesina & Passalacqua (2016) present a review of this literature

autocratic governments may have a higher tendency to build unsustainable levels of debt (see, for example, Alesina & Tabellini, 1990; Olson, 1993; Dinneya, 2006; Oatley, 2010). Relatedly, economic performance has been linked with political instability which is a typical feature of military dispensations (Gyimah-brempong & Munoz De Camacho, 1998; Guillaumont, Jeanneney, & Brun, 1999). Similarly, research shows that political instability is strongly associated with developing countries' debt crises (Ozler & Tabellini, 1991; Woo, 2003). The dispensation of military rule in Nigeria was fraught with high levels of political instability (Kalu, 1996). Notably, this had the consequence that many expensive projects were initiated and abandoned after large amounts of public funds had been committed (Ogunyemi, 2011; Edo & Ikelegbe, 2014). It is thus possible that autocracy and the attendant political instability are of important consideration in explaining Nigeria's debt problem.

Another socio-political factor that may help to explain Nigeria's public debt is armed conflict. Conflict continues to be a recurring problem in the Nigeria. Notable cases are the civil war of the late 1960s, the crisis of armed militias in the Niger-Delta region, the Islamist insurgency (Boko Haram), and more recently, the herdsmen crisis and armed banditry. In addition to heating up the polity, these crises also tend to frustrate the developmental efforts of government, particularly through the destruction of human capital and the existing critical infrastructure (Kew & Kwaja, 2013). In general, the economic implications of armed conflict have been widely debated (see for example, Collier, 1999; Guidolin, Ferrara, & Guidolin, 2010; Serneels & Verpoorten, 2012; IMF, 2019). It is reasonable that government spending will tend to respond positively to an increase in conflict, as scarce resources are justifiably channelled into the purchase of arms and ammunitions (Guidolin & Ferrara, 2010). In support of this, Dunne, Nikolaidou & Chiminya (2018) show that military spending is higher in SSA countries that have experienced conflict.

Relatedly, there are allegations of massive scandals relating to the misappropriation of resources allocated to the purchase of arms[38] (Willett, 2009; Afolabi, 2019). Such cases of corruption end up increasing government spending on defence to no avail; analysts have decried the relentless growth of military spending in the face of rising conflict in Nigeria (Ijeoma, 2014; Ezeani & Ezeibe, 2011). Thus, the tendency towards the growth of conflict-related military spending is also likely to raise the government deficits and debt (Dunne et al.,

[38] One notable incidence is the popular Dasukigate arms procurement scandal which is associated with the embezzlement of over $2 billion dollars.

2018) given the inadequacy of public finance and the recurrent fluctuations in government revenues.

4.3.2 Effects of public debt on economic growth in Nigeria

There is a large and growing body of literature that focuses on the nexus between public debt and economic growth[39]. Similar to that of determinants of public debt, most of the empirical work in this area tends to focus on groups of countries. Historically, there are two broad theoretical arguments on the growth effects of debt. Summarily, these can be categorised as the proponents and opponents of debt neutrality. The debt neutrality argument, popularly known as the Ricardian equivalence hypothesis, postulates that government borrowing has no effects on real economic variables (Barro, 1974). This argument tends to have been weakened by the persistent increases in public debt across the globe, which have often been associated with negative long-run growth effects (Modigliani, 1961; Diamond, 1965; Elmendorf & Mankiw, 1999; Panizza & Presbitero, 2013). Researchers now seem to take for granted that public debt has important economic consequences and, therefore, focus on understanding the nature and variabilities of these effects (Cecchetti, Mohanty, & Zampolli, 2011; Panizza & Presbitero, 2013; Saungweme & Odhiambo, 2018; Rahman, Ismail, & Ridzuan, 2019).

The growing levels of public debt in Nigeria as in other SSA countries continue to be an important topic of academic and policy dialogue. Researchers have expressed concern over the possibility that the debt crisis that was resolved in the mid-2000s might recur (Omotosho, Bawa, & Doguwa, 2016; Onafowora & Owoye, 2019). Most of the findings tend to support the negative effects of high and rising debt and are informative in that they mirror the harmful implications of the previous crisis (see, for example, Okonjo-Iweala, Soludo, & Murhtar, 2003; Adegbite, Ayadi, & Felix Ayadi, 2008). The more recent studies (Mba, Yuni, & Oburota, 2013; Essien, Agboegbulem, Mba, & Onumonu, 2016; Onafowora & Owoye, 2019; Ohiomu, 2020) present similar findings in most cases. Onafowora & Owoye (2019) and Ohiomu (2020), for example, employ the VAR and ARDL techniques respectively and show that external debt impacts negatively on growth and investment. In the former study using VAR, external debt tends to have enduring effect on economic performance. Conversely, Mba, Yuni, & Oburota (2013) present evidence of a positive growth effect of public debt, while Essien et al. (2016) finds evidence supporting the debt-neutrality hypothesis. This mixture of findings reflects the general lack of consensus in the public debt-growth literature.

[39] See Panizza and Presbitero (2013) and Saungweme and Odhiambo (2018) and Rahman, Ismail, & Ridzuan, (2019) for comprehensive reviews of the literature.

The recurring theme of the studies focusing on Nigeria is the direct or indirect link between debt and growth. Nevertheless, the general approach in recent years is to consider the possible presence of non-linearity (Panizza & Presbitero, 2013; Saungweme & Odhiambo, 2018). The argument here is that debt could be growth-inducing at reasonably low levels (Pattillo et al., 2002), but may become harmful for growth when accumulated in large and unsustainable amounts (Reinhart & Rogoff, 2010; Égert, 2012). The commonly reported negative link between debt and growth tends to be supportive of this argument, but it does not indicate the threshold beyond which such negative effects may set in. In general, studies that examine Nigeria's debt-growth nexus with a focus on threshold effects are very rare (Adegbite et al., 2008; Omotosho et al., 2016). While Adegbite et al. (2008), consider the question of non-linearity and find that the debt-growth nexus is non-linear in the case of Nigeria, they do not present a threshold estimate. Moreover, the study employs OLS and GLS methods and thus does not account for the possible problem of non-stationarity of variables. Conversely, Omotosho et al. (2016) estimates debt thresholds using the threshold auto-regression (TAR) method with quarterly data and find a turning point of 74%, 49%, and 32% for total public debt, external debt, domestic debt respectively. Their estimated threshold for domestic debt seems to lie outside the data range for Nigeria, and thus throws some doubt on the reliability of the estimate.

On the nature of the non-linearity, there is a large body of evidence pointing to a hump-shaped nexus between debt and growth[40]. The quadratic form of the nonlinearity is consistent with the widely-applicable Debt Laffer curve hypothesis (Sachs, 1989; Claessens, 1990) according to which the debt-growth relationship is predicted to be hump-shaped. This implies that debt could be good for growth but only up to a threshold at which the sign of the variable switches to negative implying that further accumulations may have deleterious effects on economic growth.

4.4 Model specification and data

4.4.1 Determinants of public debt

This section discusses the modelling approach to the determinants of public debt in Nigeria. The model is a combination of two separate approaches, that of Ajayi (1991) and that of Alesina & Tabellini (1990). Whereas the former attributes the growth of public debt to macroeconomic factors as in Barro (1979), the latter focuses on the influence of socio-political factors in

[40] See Panizza & Presbitero (2013) and Saungweme & Odhiambo (2018) for a review of this literature

accordance with the political-economy theory of public debt. As shown in the literature review, both sets of factors may be important in the evolution of Nigeria's public debt. The study therefore employs an empirical model that captures the influence of both factors. The macroeconomic variables that have been considered are the real GDP, government's fiscal position, inflation, oil prices, the real interest rate, and the real exchange rate, while socio-political variables are regime-type, institutional quality, and conflict. Three separate models are employed in this study. The first and main model focuses on the total debt while the second and third models focus on the external debt and domestic debt respectively. Whereas the total debt equation provides for a more representative analysis of Nigeria's public debt, the external debt equation provides a basis for comparibililty with previous panel studies where the focus is mostly on the external debt component. The analysis of domestic debt is also important considering the large amounts of the domestic debt in total debt in Nigeria. Equation (1) specifies the model:

$$ld_t = \alpha_0 + \alpha_1 ly_t + \alpha_2 fpy_t + \alpha_3 loilp_t + \alpha_4 inf_t + \alpha_5 rir_t + lrexr_6 + \alpha_7 relief_t + \alpha_8 Q_t + \varepsilon_t \quad (4.1)$$

where the dependent variable (ld_t) represents either the log of total public debt (ltd_t), the log of external debt GDP (led_t) or the log of domestic debt (ldd_t), each expressed as a share of GDP; the intercept and error terms are denoted by α_0 and ε_t respectively; The model includes two categories of explanatory variables; the economic and socio-political variables. The economic variables are the log of real GDP (ly_t), government's fiscal position (fpy_t), the log of oil prices ($loilp_t$), inflation (inf_t), the real interest rate (rir_t), the log of real exchange rate ($lrexr_6$) and a debt relief dummy ($relief_t$). The socio-political variables are captured in Q_t which includes executive ($excon_t$) as a proxy for governance quality, a regime-type dummy ($regim_t$), and a conflict dummy ($conf_t$), What follows is a more detailed description of the variables, their sources, and the a priori expectations.

Regarding the main dependent variable, total public debt, this study refers to it as the total stock of liabilities with different tenors accumulated by government operations in the past and due to be fully repaid by the government in the future. It covers only recognised direct obligations of government on which it pays interest on redemption (CBN, 2019). Furthermore, to avoid definitional ambiguities, this study refers to external debt as debt owed to non-residents, repayable in currency, goods, and services (WDI, 2020). Domestic debt on the other hand is not uniquely defined, but the three commonly used definitional criteria are applicable given the

concept of the original sin[41]. These are, the residence of the creditor, the currency of issue, and the jurisdiction of issue (Bua, Pradelli, & Presbitero, 2014). The first criterion defines domestic debt as debt issued to residents; the second defines it as debt issued in domestic currency, while the third defines it as debt issued in local financial markets. These definitions satisfy Nigeria's domestic public debt, which is referred to as debt issued to residents, in domestic currency, and in local financial markets (Asogwa & Ezema, 2005). Although the debt variables are each expressed as a share of GDP, employing a logarithmic transformation simplifies the interpretation of the results (Dunne et al., 2018). The nominal values of external and domestic debt of the central government are obtained from the Central Bank of Nigeria (CBN) Statistical Bulletins. Total public debt is then computed as the sum of external and domestic debt, and further as a share of local currency GDP.

Turning to the explanatory variables, the log of real GDP is presented as an important determinant of debt in the literature. It is expected that a fast and sustained increase in the real GDP will tend to bring about declines in the debt burden. It is however possible that an increase in the variable or the expectation of it could lead a government to accumulate more debt (Woo, 2003). Thus, the expected sign of this variable is not clear *a priori*.

To capture the importance of oil in the Nigerian economy, the model includes the log of oil price. Improvements in oil revenues are expected to have a debt-reducing effect. Data on oil prices are the average annual OPEC crude oil prices in US dollars per barrel. The OPEC crude oil price is defined by the so-called OPEC basket which is the weighted average of prices of the various petroleum blends that are produced by the OPEC members (OPEC, 2020). The OPEC basket is one of the most important benchmarks for crude oil prices worldwide. Others are the UK Brent, the West Texas Intermediate spot prices (WTI), and the Dubai Crude. Data on crude oil prices are extracted from the World Bank Commodity Price Database.

In line with the preponderance of evidence supporting the role of persistent government spending and deficits, the model accounts for government's fiscal position, measured as government surplus/deficit as a share of GDP. The variable is computed as the difference between government's spending and the total receipt from revenue which could either be a surplus or deficit, depending on the size of spending *vis-à-vis* the revenue. It is expected to have a negative sign in the regression as government surpluses will tend to lead to a fall in debt while deficits will have the opposite effect. Data on government's fiscal position are obtained

[41] Nigeria, like many other developing countries, is a victim of the original sin, a concept used to refer to the inability of a country to borrow abroad in its domestic currency (Eichengreen, Hausmann, & Panizza, 2003).

from the CBN Statistical Bulletins. The influence of macroeconomic instability is captured using the consumer price index (inf_t), a proxy for inflation.

Regarding the a priori expectation, high levels of inflation are an indication of macroeconomic uncertainty (Nguyen, 2015) which could create volatility in budget deficits through its effect on government revenue and spending (Javid et al., 2011). In this case, the variable is predicted to have a positive sign in the regressions. However, given the fact that inflation reduces the real interest rate paid on debt (Escolano, 2010), inflation may be debt-reducing in cases where the governments employs it as a means of reducing the debt burden (Reinhart & Sbrancia, 2015; Akitoby et al., 2014). The plausibility of such argument derives from the large share of domestic debt in total public debt (Forslund, Lima, & Panizza, 2011; Gnangnon, 2014). Data on consumer price indices are obtained from the World Development Indicators.

The real interest rate (rir_t) is likewise considered as an important economic variable given the historically large amounts of domestic debt in Nigeria (Forslund, Lima, & Panizza, 2011). However, given that the choice between domestic and external debt boils down to the analysis of costs and risks (Beaugrand, Loko, & Mlachila, 2002), high domestic interest rates relative to global interest rates may lead a country to borrow more externally, particularly if external financing is available at concessional rates (Beaugrand et al., 2002). In this view, external debt may also be affected by changes in domestic interest rates. A priori, the variable is expected to have a positive sign in the regressions. Data on real interest rate are obtained from the World Development Indicators.

The real exchange rate is included mainly because of the foreign currency denomination of Nigeria's external debt[42]. The expected sign of the variable is ambiguous. On one hand, due to valuation effects, a depreciation of the real exchange rate may tend to lead to an increase in external debt. It is in this line of argument that sudden debt explosions have been linked to the effect of real depreciation (Campos et al., 2006). On the other hand, there is the possibility that exchange rate depeciation could be debt-reducing if it induces an increase in export revenues that enhance the country's ability to service its debt (Gnangnon, 2014). Following Habib, Mileva, & Stracca (2017), the study employs as the measure of real exchange, the bilateral rate measured as the price level of Purchasing Power Parity GDP – US$ (PPP/EXR) obtained from Penn World Tables (PWT 9.1).

[42] Real depreciation is referred to as a fall in the real exchange rate which will cause more of a country's domestic goods to exchange for less of foreign goods.

Finally, the debt relief dummy captures the impact of the 2005 debt cancellation on Nigeria's public debt. The expected sign of the variable is not clear. On one hand a negative sign could be attributed to the drastic debt reductions resulting from the debt relief. On the other hand, a positive sign could reflect the increased fiscal space created by the debt relief which has quite often been associated with the growing levels of public debt.

Turning to the socio-political variables, governance quality, measured as the constraints on the executive refers to the extent to which a government is subject to checks and balances in all of its decision-making processes. The variable employs a 7-point scale where countries with the highest institutionalised constraints are ranked 7 and countries with the lowest constraints are ranked 1. The variable is expected to have a negative sign in the regressions. Data on $excon_t$ are obtained from the Polity IV Database.The Regime-type dummy accounts for whether the country was in any given year under an autocratic (i.e., military) or democratic government. The variable is given the value 1 if the government was under military dictatorship in any given year, and zero if the chief executive was democratically elected. Autocratic governments are often considered as being more prone to over-borrowing (Oatley, 2010). A positive relationship is therefore expected. The variable ($regim$) is derived from the database of political institutions (DPI)[43].

The model also includes a measure of armed conflict, a dummy variable which takes on the value one in a year of armed conflict, that is, a year in which there are at least 25 battle deaths, and zero otherwise. A positive relationship between $conflict$ and debt is expected a priori. The conflict dummy is constructed using the Uppsala Conflict Data Programme (UCDP) and the Peace Research Institute Oslo (PRIO) armed conflict database. It is important to note that preliminary tests indicate that executive constraints and the regime-type dummy are highly correlated and also present a high variance inflation factor. For this reason, they have been included in separate estimations to avoid problems of multi-collinearity. Table 4-1 presents a quick summary of the variables, their expected signs, and sources of the data.

[43] In the DPI, the dummy variable called $regim_t$ is dubbed "military."

Table 4-1. Brief description of variables and their sources

Variable Name	(1) Description	(2) Expected sign	(3) Source
	Determinants of public debt		
Dependent variables			
ltd	log of total debt (% of GDP)		CBN
led	log of external debt (% of GDP)		WDI
ldd	log of domestic debt (% of GDP		CBN
Explanatory variables			
ly	log of Real GDP	ambiguous	WDI
fpy	govt. fiscal position – deficit/surplus	+	CBN
loilp	log of oil price	-	Bloomberg
inf	consumer price index	ambiguous	WDI
rir	real interest rate	(+)	WDI
lrexr	the real exchange rate (PPP/EXR)	ambiguous	PWT
relief	debt relief dummy	ambiguous	-
excon	executive constraints	-	Polity IV
regim	regime dummy	+	DPI
conf	armed conflict dummy	+	UCDP/PRIO
	Non-linear effects of public debt		
Dependent variable			
lpky	log real GDP per capita		WDI
Explanatory variables			
td	total debt (% of GDP)	-	CBN
ed	eternal Debt (% of GDP)	-	WDI
dd	domestic debt (% of GDP)	-	CBN
lpop	Population growth rate	-	WDI
open	Trade openness	+	WDI
gfcf	gross fixed capital formation (% of GDP)	+	WDI
loilp	log oil prices	+	Bloomberg
fc	financial crisis dummy	-	-

Note: CBN denotes the Central Bank of Nigeria, WDI, the World Development Indicators and PWT, the Penn World Tables; DPI is the Database of Political Institutions, while UCDP/PRIO stands for the Uppsala Conflict Data Programme/Peace Research Institute Oslo.

4.4.2 The non-linear effects of public debt in Nigeria

Turning to the debt-growth nexus, the main issue of interest, here, is to examine the non-linear effects of public debt on growth in Nigeria. This overarching research objective branches out into two; the first is to verify the existence of a non-linear effect, and the second, to determine the turning point (threshold). In reaching these objectives the study employs the more common approach to this question in the literature; a growth model augmented with the debt variable and and its quadratic term to account for possible presence of a nonlinear effect (see, for example, Kumar & Woo, 2010; Checherita-westphal & Rother, 2012; Afonso & Jalles, 2013). The major criticism of this method is that the evidence of an inverse-U can be driven by extreme observations (Lind & Mehlum, 2010; Panizza & Presbitero, 2013). Fortunately, however, there is a semi-parametric method that allows one to test whether the threshold

estimate is duly supported by the data (Sasabuchi, 1980; Lind & Mehlum, 2010). Within the time series framework, regime-switching and threshold auto-regression models have also been employed for similar purposes (see for example, Doğan & Bilgili, 2014; Akram & Rath, 2018; Ndoricimpa, 2020). However, the chosen approach is attractive, particularly because of the use of a relatively short annual time series in the study.

To examine the nonlinear effects of public debt on economic growth in Nigeria, the study employs an augmented growth model following the modelling approach of Pattillo et al. (2002) who focus on developing countries. The growth model is augmented with the variable of interest, i.e., public debt along with its squared term to account for the possible presence of a nonlinear effect. It also includes a lag of the dependent variable to account for the important role of initial income. Additionally, we extend the basic framework with the inclusion of the log of oil prices due to its pivotal role in explaining Nigeria's economic performance. The model is specified as follows:

$$lpky_t = \beta_0 + \beta_1 lpky_{t-1} + \beta_2 d_t + \beta_3 {d^2}_t + \beta_4 gfcf_t + \beta_5 lpop_t + \beta_6 open_t + \beta_7 loilp_t + \beta_8 fc_t + \epsilon_{it} \quad (4.2)$$

where, the dependent variable $lpky_t$ is the log of per capita GDP and ϵ_t is the error term. The lagged dependent variable is denoted by $lpky_{t-1}$. Gross fixed capital formation as a ratio of GDP ($gfcf_t$) is included as the measure of capital stock. It is expected to have a positive sign. The log of population ($lpop_t$) is included as a proxy for labour and is expected to have a negative coefficient given that an increase in the variable leads to a fall in per capita income. Trade openness ($open$), measured as the sum of exports and imports (% of GDP), captures the gains from trade with the rest of the world and is thus expected to have a positive sign in the regressions. The log of oil prices ($loilp_t$) accounts for the central role of oil revenues in Nigeria's economic performance. Improvements in oil revenues are expected to have a positive effect on economic performance. A crisis dummy (fc) captures the influence of the global financial crisis. See Table 4-.1 for the summary of variables along with their sources.

Turning to the main variable of interest, three alternative measures of public debt (d), are employed as in the determinants model. These are, total debt (td_t), external debt (ed_t), and domestic debt (dd_t), each as a share of GDP. These variables are as previously defined in Section 4.4.1. To capture the possible non-linear relationship between public debt and growth, a quadratic term (d^2) is included in equation (4.2). Previous debt-growth studies that employ a quadratic specification have concluded in favour of an inverse U-shaped nexus if the quadratic term is negative and significant, and the extreme point lies within the data range. This

conventional procedure for examining non-linearity has, however, been considered inadequate given the possibility that the result could be driven by extreme observations (Lind & Mehlum, 2010; Panizza & Presbitero, 2013).

Table 4-2. Descriptive statistics

	(1) mean	(2) std dev.	(3) max	(4) min
Variables				
total debt	28.317	22.597	79.688	7.200
external debt	30.080	29.644	120.825	3.771
domestic debt	11.882	4.083	23.044	5.772
log real gdp	3094.167	1715.382	6980	1430
fiscal position	-1.978	2.661	9.163	-7.827
oil price	34.006	29.160	107.46	1.210
inflation	18.567	15.887	72.835	3.457
real interest rate	-1.673	14.414	18.180	-65.857
real exchang rate	0.534	0.259	1.162	0.098
regime	0.521	0.505	1	0
executive const.	3.271	2.376	7	1
conflict	0.208	0.410	1	0
gdp per capita	270252.7	59728.43	385349	199039.2
investment	75.930	76.575	264.775	14.168
population	110.356	39.533	190.873	55.982
trade openness	33.273	12.281	53.278	9.136
financial crisis	0.167	0.377	1	0

Note: real GDP (y) in trillions of local currency (naira); per capita income (pky) is measured in local currency; population (pop) in millions.

A sufficient condition for verifying an inverse-U is proposed within the likelihood-ratio framework originally developed by Sasabuchi (1980) and modified by Lind & Mehlum (2010). This test is referred to as the Sasabuchi-Lind-Mehlum (SLM) test. The inequalities in equations (4.3) and (4.4) below are the hypotheses of the SLM approach by which one can test, on some interval, whether the debt-growth nexus is increasing at low values but decreasing at high values of debt. Given equation (4.2) and the maintained assumption of one turning point, an inverse U-shape requires a rejection of (4.3) in favour of (4.4):

$$H_0: \beta_1 + 2\beta_2 d_L \leq 0 \text{ and/or } H_0: \beta_1 + 2\beta_2 d_H \geq 0 \quad (4.3)$$

$$H_1: \beta_1 + 2\beta_2 d_L > 0 \text{ and } H_1: \beta_1 + 2\beta_2 d_H < 0 \quad (4.4)$$

Summarily, the test rejects the null hypothesis of monotone or U-shape only if either H_0^L or H_0^H or both can be rejected at the α level of significance.

This study relies on annual time series data that spans the period 1970-2017. The time period is determined by data availability as data on political variables are only available up to 2017.

Table 4-2 presents descriptive statistics of the variables. It shows large variations between the minimum and maximum values of total and external debt shares. For both variables, the standard deviations are further indicative of substantial variations in the ratios within the range of the extreme values. These variations may be attributed to the effects of debt rescheduling and debt forgiveness, and to the changes in the composition of external and domestic debt. Also notable are the measures of variation for oil price, interest rate, and inflation, all of which are indicative of the extent of macroeconomic uncertainties that have affected the Nigerian economy over the past decades. The large fluctuations in oil prices are reflective of the positive and negative shocks to oil revenues. Similarly, average double-digit inflation has been experienced over the study period, indicating some extent of macroeconomic instability.

4.5 Methods of estimation

4.5.1 The ARDL approach to co-integration

This section discusses the co-integration approach through which the analyses of the determinants and non-linear effects of public debt are carried out. Co-integration methods are popular for their applicability in modelling long-run time-series relationships. While several of these approaches have been employed in the relevant literature[44], this study employs the autoregressive distributed lag approach (ARDL) approach (Pesaran & Shin, 1999; Pesaran, Shin, & Smith, 2001). The ARDL technique is the workhorse for the analyses of dynamic single-equation models and has several advantages. First, It obviates the limiting requirement in previous co-integration techniques that all variables in the model must be uniformly non-stationary of the first order (hereinafter, I(1)). By allowing a mixture of stationary, non-stationary and mutually integrated variables[45], the model eliminates a great deal of uncertainty from the analysis (Pesaran et al., 2001; Narayan, 2004). Second, the method facilitates the simultaneous estimation of long-run and short-run parameters through the error-correction process. This feature of the ARDL model is useful in this study given the long-term approach to the formulation of debt-management policies (DMO, 2005). Third, the ARDL model is relatively more efficient in small-sized or finite samples in determining the existence of long-run relationships (Narayan, 2004). Lastly, it allows each variable in the model to have its own lag structure.

[44] Within the single equation framework, Engle & Granger (1987) and Phillips & Ouliaris (1990) discuss the residual-based two-test technique. The multivariate cointegration approaches proposed by Johansen (1988, 1996) and Johansen & Juselius (1990), are within the system-based and maximum likelihood frameworks.

[45] This mixture of stationary and non-stationary variables is, however, only allowed for I(0) and I(1) variables. That is, non-stationarity may not exceed the first order.

4.5.2 The ARDL model

Given the foregoing, equations (1) and (2) are now re-specified, each as an ARDL(p, q) process in the form given in equations (4.5) and (4.6):

Model 1: Determinants of public debt

$$\Delta ld_t = a_0 + a_1 t + a_2 Q_t + \sum_{i=1}^{p-1} \gamma_{1i} \Delta\, ld_{t-i} + \sum_{i=0}^{q-1} \gamma_{2i} \Delta\, ly_{t-i} + \sum_{i=0}^{q-1} \gamma_{3i} \Delta\, fpy_{t-i} + \sum_{i=0}^{q-1} \gamma_{4i} \Delta\, loilp_{t-i} + \sum_{i=0}^{q-1} \gamma_{5i} \Delta\, inf_{t-i} + \sum_{i=0}^{q-1} \gamma_{6i} \Delta\, rir_{t-i} + \sum_{i=0}^{q-1} \gamma_{7i} \Delta\, lrexr_{t-i} + \gamma_8 ld_{t-1} + \gamma_9 ly_{t-1} + \gamma_{10} fpy_{t-1} + \gamma_{11} loilp_{t-1} + \gamma_{12} inf_{t-1} + \gamma_{13} rir_{t-1} + \gamma_{14} lrexr_{t-1} + \upsilon_t \quad (4.5)$$

Model 2: The non-linear effects of public debt

$$\Delta lpky_t = b_0 + b_1 t + b_2 fc_t + \sum_{i=1}^{p-1} \delta_{1i} \Delta\, lpky_{t-i} + \sum_{i=0}^{q-1} \delta_{2i} \Delta\, d_{t-i} + \sum_{i=0}^{q-1} \delta_{3i} \Delta\, d_{t-i}^2 + \sum_{i=0}^{q-1} \delta_{4i} \Delta\, gfcf_{t-i} + \sum_{i=0}^{q-1} \delta_{5i} \Delta\, lpop_{t-i} + \sum_{i=0}^{q-1} \delta_{6i} \Delta\, open_{t-i} + \sum_{i=0}^{q-1} \delta_{7i} \Delta\, loilp_{t-i} + \delta_8 lpky_{t-1} + \delta_9 d_{t-1} + \delta_{10} d_{t-1}^2 + \delta_{11} gfcf_{t-1} + \delta_{12} lpop_{t-1} + \delta_{13} open_{t-1} + \delta_{14} loilp_{t-1} + \xi_t \quad (4.6)$$

In both equations (4.5) and (4.6), p and q are the lag lengths which are determined by the AIC criterion; Δ is the difference operator used to depict the short-run dynamics; In **equation (4.5)**, a_0 is the intercept, t is the time trend, and υ_t is the error term; the fixed regressors, *executive constraints*, *regime*, *conflict*, and *debt relief* are captured in Q_t. The short-run and long-run parameters are denoted by $\gamma_1 - \gamma_7$ and $\gamma_8 - \gamma_{14}$ respectively. In **equation (4.6),** b_0 and t are the intercept and trend terms respectively while fc is the crisis dummy; the short-run parameters are denoted by $\delta_1 - \delta_7$ while the long run parameters are denoted by $\delta_8 - \delta_{14}$. The variables are as previously defined.

The ARDL bounds test approach to co-integration is based on the joint F–statistic which forms the accept/reject criteria under the null hypothesis that there exists no long-run relationship between the variables. Pesaran et al. (2001) and Kripfganz & Schneider (2018) present two sets of critical bounds; the lower and upper bounds. The lower bound is calculated on the basis of the assumption that the variables are I(0), that is are not co-integrated. Conversely, the upper bound employs the assumption that all variables are I(1), that is, are co-integrated. The null

hypothesis for the determinants model (**model 1**) can be formulated as: ($\gamma_8 = \gamma_9 = \gamma_{10} = \gamma_{11} = \gamma_{12} = \gamma_{13} = \gamma_{14}$) against the alternative hypothesis: ($\gamma_8 \neq \gamma_9 \neq \gamma_{10} \neq \gamma_{11} \neq \gamma_{12} \neq \gamma_{13} \neq \gamma_{14}$). Similarly, the null hypothesis for **model 2** can be expressed as ($\delta_8 = \delta_9 = \delta_{10} = \delta_{11} = \delta_{12} = \delta_{13} = \delta_{14}$) against the alternative hypothesis: ($\delta_8 \neq \delta_9 \neq \delta_{10} \neq \delta_{11} \neq \delta_{12} \neq \delta_{13} \neq \delta_{14}$). If the calculated F statistic falls below the lower critical bound, the null hypothesis cannot be rejected. An F statistic that lies above the upper critical bound will support the rejection of the null and lead to the conclusion that the variables are co-integrated. If it falls between the lower and upper critical bounds, then the inference is inconclusive.

It is conventional to carry out diagnostic tests to evaluate the validity and reliability ARDL estimations (Pesaran, Shin, & Smith, 1999). To this end, the study employs the Breusch-Godfrey LM for autocorrelation, the Engle's ARCH LM test for autoregressive conditional heteroscedasticity, Breusch-Pagan/Cook-Weisberg test for heteroscedasticity, the RESET test for the correct functional form, and the Jarque-Berra test for normality. In all cases, a non-rejection of the null hypothesis would indicate that the performance of the models does not violate the assumptions of the classical linear regression model. To test for model stability, the study employs the cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares (CUSUMSQ) plots. A conclusion is reached in favour of model stability if the values of both tests lie within the 5% critical bounds.

4.5.3 Unit root test

A fundamental assumption of the bounds test is that all variables must either be I(0) or I(1). This implies that the test will yield spurious results in the presence of I(2) variables. To ensure that the variables do not violate this fundamental requirement, there is a need to test for the presence of unit root. In carrying out these tests, the study considers that the sample period includes major events like the oil boom and oil glut of the 1970s and 1980s, the debt relief agreement of 2005-2006, and the global financial crises of 2008, which could introduce breaks in the trends of the time series. Conventional unit root tests have been found to be biased towards the non-rejection of the null of unit root when structural breaks are present (Perron, 1989; Clemente, Montanes, & Reyes, 1998). In consideration of this, the study employs a variety of unit root tests, including those designed to accommodate one or more structural breaks. The analyses of the unit root properties of variables begin with the conventional tests: the augmented Dickey-Fuller (ADF), Phillips-Perron, and Kwiatkowski-Phillips-Schmidt-Shin (KPSS). The first two are based on the null hypothesis of unit root (Dickey & Fuller, 1979;

Phillips & Perron, 1988), while the KPSS test employs a null hypothesis that a variable is trend or level stationary (Kwiatkowski, Phillips, Schmidt, & Shin, 1992).

Turning to the tests that account for structural breaks, the study employs the Clemente et al. - CMR (1998) tests which are specifically designed for this purpose. The CMR (1998) technique accounts for possible changes in a series at one or two unknown dates. It presents two models of breakpoint unit root test: the additive outlier (AO) model and the innovative outlier (IO) model (Perron, 1990; Perron & Vogelsang, 1992). Whereas the former accounts for an instantaneous change in response to a transitory shock, the latter models a gradual change in a series due to a persistent shock. In this study, it is believed that the suitability of each of these tests will vary from one variable to another. For example, whereas the implementation of the debt relief agreement in 2006 led to an instantaneous decline of the public debt, a variable such as government's fiscal position exhibits persistence as evidence has suggested (Taiwo, 1989) and may therefore respond gradually to a shock. In order to account for this variability, we present results from both versions of the CMR tests. The tests employ the null hypothesis of unit root which is rejected if a test statistic is greater than the 5% critical value. The procedure for implementing the tests begins with the less restrictive forms: AO2 and IO2 which include the changes in both intercepts and trends. If a variable is not significant, we then apply the more restrictive forms: AO1 and IO1, which include only the intercept. The latter forms of the model account for only one breakpoint whereas the former account for two breaks.

The results of the ADF and KPSS tests are presented in Table 4-3. All the variables are a mix of I(0) or I(1) in both the ADF and KPSS tests as required. Both of the tests present similar results in general; the majority of the variables are first difference stationary in both cases. There are, however, a few cases of mixed findings: *trade openness* is I(1) in the ADF test but turns out to be I(0) in the KPSS test. Conversely, the *log oil price* and the *real interest rate* are I(0) in the ADF test, but I(1) in the KPSS. Overall, the test results accord with the chosen estimation technique which requires that the variables may only be a mix of I(0) and I(1).

Regarding the unit root tests in the structural break framework, the results (see Table 4-4) are, in general similar to ones obtained from the conventional tests presented in Table 4-3. The estimated breakpoints seem to point to the economic crisis of the 1980s and 1990s, and the debt reliefof 2005. Overall, the breakpoint unit root tests indicate that except for government's fiscal position (fpy), consumer price index (inf), real interest rate (rir), and gross fixed capital formation ($gfcf$) which are stationary at levels, all other variables are first-differenced stationary.

Table 4-3. Unit root test results

	ADF Test			KPSS Test		
Variable	**@levels**	**@First Diff**	**CV**	**@levels**	**@First Diff**	**CV**
log total debt	-1.813	-3.582 **	-2.947	0.477**	0.114	0.463
log ext. debt	-1.527	-4.332***	-3.621	0.555**	0.201	0.463
log dom. debt	-2.634	-5.923***	-3.614	0.597**	0.047	0.463
log real gdp	-2.084	-4.042***	-3.641	0.921***	0.211	0.463
fiscal position	-5.640***	-	-3.600	0.152	-	0.463
log oil price	-2.911**	-	-2.605	1.54***	0.286	0.463
inflation	-2.814*	-	-2.606	0.191	-	0.463
real interest rate	-3.613***	-	-3.607	0 .870***	0.033	0.347
log real ex. rate	-2.095	-3.299**	-2.950	1.020***	0.70	0.739
log gdp per capita	-1.338	-2.838*	-2.608	0.504**	0.213	0.463
Investment/gdp	-1.515	-4.304***	-3.614	0.960***	0.330	0.463
log population	-0.182	-2.935**	-2.952	1.070***	0.113	0.347
trade openness	-2.373	-5.073***	-3.614	0.337	-	0.347

Note: *, **, and ***, denote significance at 10%, 5%, and 1% respectively. The ADF test employs the null that a variable is nonstationary. The KPSS provides complementary evidence where the null is that a variable is stationary. CV denotes “critical value” at 10%, 5% or 1%.

Table 4-4. CMR tests for unit root in the presence of one or two structural breaks

		Panel A: Additive outlier (AO) model			
		@ Levels		@ First Difference	
variable	**5% CV**	**Breakpoints**	**Test stat**	**Breakpoints**	**Test stat**
log total debt	-3.560	1997*	-2.677	2003*	-4.849
log external debt	-5.490	1984***; 2003***	-4.456	1991, 2004	-5.755
log domestic debt	-5.490	1984***, 2001***	-3.400	1979, 1994	-6.528
log real gdp	-3.560	2005***	-2.815	1981	-5.876
fiscal position	-5.490	1989*, 1992*	-6.338	-	-
log oil price	-5.490	2001***, 2007	-3.628	1981** 1996	-7.461
inflation	-5.490	-1993***, 1997***	-7.318	-	-
real interest rate	-5.490	1997, 1993***	7.227	-	-
log real exchange rate	-5.490	1987***, 2000***	-2.981	1996***, 2003	-10.761
log gdp per capita	-3.560	2011	-1.550	1981	-5.955
investment/gdp	-5.490	1982*** 2001**	-5.988	-	-
log population	-5.490	1989***, 2003***	-2.503	2000, 2012	-8.132
trade openness	-5.490	1978***, 1988***	-4.032	1978*, 1983*	-9.148
		Panel B: Innovative outlier (IO) model			
log total debt	-4.270	2002**	-2.951	1998	-5.575
log external debt	-4.270	2003**	-2.466	1992	-5.904
log domestic debt	-5.490	1981**, 2000***	-4.281	1980, 1995	-7.578
log real gdp	-5.490	1979*** 2003***	3.443	1977, 2003**	-7.641
fiscal position	-5.490	1988**, 1993**	-6.277	-	-
log oil price	-5.490	1977, 2003**	-3.100	1981**, 1997	-7.104
inflation	-5.490	1986***; 1994***	-8.785	-	-
real interest rate	-5.490	1980, 1994***	-10.592	-	-
log real exchange rate	-5.490	1984***; 1997***	-4.921	1997***, 2001***	-14.062
log gdp per capita	-4.270	2000**	-3.106	1982*	-6.094
investment/gdp	-5.490	1979***; 1998**	-7.246	-	-
log population	-5.490	1995, 2003***	-3.769	1985***, 2005***	-5.751
trade openness	-5.490	1979***, 1987***	-5.427	1979***, 1983***	-9.031

Note: ***, ** & * denote significance at the 1%, 5% and 10% levels respectively. Panels A and B present the CMR test results for the AO and IO models respectively. Here the null of unit root is rejected if the test statistic is greater than the 5% critical value.

4.6 Results and discussion

4.6.1 Determinants of total and external public debt in Nigeria

Having confirmed from the unit root tests that there are no I(2) variables in the models, the next step in the analysis involves testing for the presence of a long-run relationship between public debt and the selected variables. Optimal lags are selected using the Akaike information criterion (AIC) following which the study then proceeds to the bounds test for the levels relationship. The bounds test results for the determinants of debt are presented in Table 4C-1 of the Appendix C The computed F-test statistics are compared with the lower and upper critical bounds of Pesaran et. al. (2001) and Kripfganz & Schneider (2018). In all three models of total, external, and domestic debt, the results indicate the rejection (at 1%) of the null hypothesis of no co-integrating relationship among the variables, strongly confirming the presence of a long-run relationship in the models.

Given the evidence of co-integration in the models, the study now explores the long-run and short-run dynamics using the error correction model. This procedure allows one to make inferences about the adjustments to the long-run equilibrium path in the event of short run deviations. The results for the long-run models are presented in Table 4-5. Overall, the variables accord with the a priori expectations in terms of the signs of the coefficients.

Table 4-5. Long-run estimates for determinants model (1970-2017)

	Total debt model		external debt model		domestic debt model	
	1	2	1	2	1	2
log real gdp	-0.855	-0.748	-1.248***	-1.224***	0.500	0.435
	(0.754)	(0.802)	(0.322)	(0.300)	(0.390)	(0.388)
fiscal position	-0.242***	-0.209***	-0.110***	-0.106***	-0.072**	-0.071**
	(0.047)	(0.049)	(0.027)	(0.026)	(0.029)	(0.028)
log oil price	-0.455***	-0.280*	-0.261*	-0.275*	0.162	0.149
	(0.146)	(0.163)	(0.132)	(0.137)	(0.097)	(0.097)
inflation	-0.012	0.001	0.005	0.005	0.031***	0.030***
	(0.008)	(0.007)	(0.003)	(0.003)	(0.007)	(0.006)
real interest rate	0.034***	0.040***	0.014***	0.015***	0.089***	0.086***
	(0.009)	(0.010)	(0.004)	(0.004)	(0.018)	(0.017)
log real ex. rate	0.939***	0.967***	0.389**	0.423***		
	(0.336)	(0.332)	(0.154)	(0.149)		
Fixed regressors and deterministics						
relief	-0.676***	-0.772***	-0.827***	-0.808***		
	(0.171)	(0.185)	(0.107)	(0.105)		
executive const.		0.013		0.002		0.008
		(0.017)		(0.017)		(0.011)
regime	-0.042		0.043		-0.037	
	(0.108)		(0.117)		(0.062)	
conflict	0.016	0.052	0.320**	0.325**	-0.083	-0.078
	(0.111)	(0.119)	(0.123)	(0.121)	(0.061)	(0.062)
trend	0.003	-0.004	0.026*	0.024**	-0.022***	-0.021***
	(0.012)	(0.011)	(0.013)	(0.011)	(0.004)	(0.003)
constant	8.003	19.310	-6.091	-2.265	-5.485	-4.800
	(14.898)	(12.453)	(18.112)	(14.862)	(4.244)	(4.420)
Observations	46	47	46	46	45	45

Note: ***, **, & * denote significance at 1%, 5% and 10% respectively. Robust standard errors are in parenthesis. Given the high correlation between the regime-dummy and executive constraints, they are included in two separate estimations: in each category, ***column 1*** includes regime-dummy while ***column 2*** includes executive constraints.

Although, economic growth as measured by real GDP, is not statistically significant in the total and domestic debt models, it turns out to be strongly significant in the external debt model. A negative sign on the coefficient suggests that economic growth has a reducing effect on external debt. This result accords with many previous panel studies such as Woo (2003) and Bittencourt (2015).

Regarding the role of government's fiscal position, the evidence strongly suggests that government deficit/surplus is a key determinant of Nigeria's public debt. In all three models, the results present the expected negative and statistically significant effect supporting the conjecture that deficits are debt-inducing while surpluses are debt-reducing. Persistent government spending vis-à-vis the dwindling revenues has been identified as a key factor in the evolution of Nigeria's debt problems (Ogunyemi, 2011). This result has strong support in several previous studies such as those of Taiwo (1988), Ajayi (1991, Ogunyemi (2011), and Jibir & Aluthge (2019), all of which focus on the case of Nigeria. On the effect of oil prices, the negative sign on the coefficient is consistent with the a priori expectation. The estimates are significant in the total and external debt models. This confirms the debt-reducing role of oilprices and gives support for the importance of oil revenues to the sustainability of public debt in Nigeria. Conversely, the estimates are positive but insignificant in the domestic debt model. Previous studies such as that of Adamu & Rasiah (2016) also present a negative and statistically significant estimate of oil price in their study which focuses on the external debt component.

Regarding the effect of inflation as measured by the consumer price index, the estimates are, on one hand, insignificant in the total and external debt models. On the other hand, the domestic debt model presents a positive and strongly significant estimate which affirms the debt-inducing impact of macroeconomic instability. The economic significance of this result derives from the argument that macro-instability could create volatility in budget deficits and debt through its effect on government revenue and spending (Javid et al., 2011). Supportive previous evidence such as that of Bildirici & Ersin (2007) suggests that the effect of inflation on public debt depends majorly on the share of domestic debt in total public debt. That is, inflation may have stronger effects on debt in countries with large amounts of domestic public debt. This argument seems to have relevance in the case of Nigeria given the historically large shares of domestic debt in Nigeria's total public debt. Contrary evidence such as the ones presented by Abbas et al. (2014), Akitoby et al. (2014), and Bittencourt (2015) suggests that inflation may be debt-reducing.

The real interest rate has a positive and strongly significant effect in all the three sets of regressions. The evidence gives compelling support for the debt-inducing role of the variable in Nigeria. This seems to reflect the high cost of managing the large amounts of domestic debt in the country. The positive impact of the real interest rate in the external debt model seems to indicate the role it plays in determining the choice between external and domestic debt (Beaugrand et al., 2002). The result finds support in Essien et al. (2016) who employ the VAR

and Granger causality techniques, and contradicts that of Abdullahi et al. (2015) who also takes the ARDL approach.

On the role of the real exchange rate, the results present a positive and significant effect in total and external debt models, suggesting that real currency depreciations are debt-inducing in Nigeria. Evidence is presented to the contrary in previous studies such as those of Ajayi (1991), Bandiera (2008) and Abdullahi et al. (2015).

The debt relief dummy has the expected negative sign and is also significant in the models, affirming the impact of the historic debt relief intervention of 2005 on public debt in Nigeria. Turning to socio-political variables, the study yields some rather surprising results. The *regim* dummy and *executive constraints* are not statistically significant, contrary to the evidence in previous panel studies such as Woo (2003) and Oatley (2010). As for *armed conflict*, whereas the estimates are insignificant in the total and external debt models, they turn out to be significant (and positive signed as expected) in the external debt model. This result seems intuitive and tends to show that the growth of external debt in Nigeria may be associated with the persistent problem of armed conflict in the country. In agreement, previous studies have linked the external debt crises in developing countries to conflict-related military spending (see for example, Danso, 1990; Dunne et al., 2018).

The results of the short-run error correction model are presented in Table 4-6 which shows considerable evidence in support of short-run effects. Economic growth tends to have a debt-reducing effect in the domestic debt model. Government's fiscal position presents a positive and significant effect in all the three models. This seems to imply that in the short run, a strong fiscal position encourages borrowing, while a weak position discourages it. The log of oil price also has a positive and significant effect in the total debt model. This could imply that increases in oil revenues lead the government to borrow more in the short run. As for inflation, the impact seems to vary between the total and domestic debt model. In the total debt model, the variable presents a positive effect which is consistent with debt-inducing role of macroeconomic instability in the long-run. On the other hand, inflation has a negative effect in the domestic debt model which points to the possibility that the government may be using inflation to cut down on the real value of debt in the short run. As expected, the error correction term corresponding to the total, external, and domestic debt models is negative and highly significant, giving support to the evidence of co-integration in the models.

Table 4-6. Error correction representation for determinants model (1970-2017)

	total debt model		external debt model		domestic debt model	
	1[a]	2[b]	1[c]	2[c]	1[d]	2[d]
Δlog ext. debt(-1)			-0.153	-0.145		
			(0.108)	(0.106)		
Δlog real gdp					-1.665***	-1.593***
					(0.428)	(0.426)
Δlog real gdp(-1)					-1.953***	-1.919***
					(0.455)	(0.441)
Δfiscal position	0.046***	0.019*	0.087***	0.085***	0.014**	0.013*
	(0.016)	(0.011)	(0.019)	(0.020)	(0.007)	(0.007)
Δfiscal position(-1)	0.012		0.055***	0.053***		
	(0.011)		(0.014)	(0.014)		
Δlog oil price	0.364***	0.383***	0.198	0.201		
	(0.112)	(0.122)	(0.172)	(0.174)		
Δinflation	0.008***	0.006**			-0.005**	-0.005**
	(0.002)	(0.002)			(0.002)	(0.002)
Δinflation(-1)	0.005**				-0.007***	-0.007***
	(0.002)				(0.002)	(0.002)
Δreal interest rate			-0.007*	-0.007*	-0.017***	-0.017***
			(0.003)	(0.003)	(0.005)	(0.004)
Δreal interest(-1)					-0.010***	-0.010***
					(0.003)	(0.003)
Δreal interest(-2)					-0.004***	-0.004***
					(0.001)	(0.001)
Δlog real ex. rate	-0.120	-0.322*				
	(0.234)	(0.190)				
Δlog real ex. rate(-1)	0.310					
	(0.196)					
ECM(-1)	-0.402***	-0.361***	-0.508***	-0.510***	-0.376***	-0.385***
	(0.067)	(0.069)	(0.105)	(0.105)	(0.088)	(0.090)

Notes: *, **, ***, denote significance at 10%, 5%, and 1%; Robust standard errors in parenthesis; Δ stands for the difference operator. In each category, model 1 includes the regime dummy while model 2 includes executive constraints. The results on these variables are included in Table 4-5 under ***fixed regressors***. Lag structures are selected using the AIC criterion as follows:

[a] ARDL(1 0 2 1 2 0 2)
[b] ARDL (1 0 1 1 1 0 1)
[c] ARDL(2 0 2 1 0 1 0)
[d] ARDL(1 2 1 0 2 3)

The regression results for the determinants of the debt were tested for validity and reliability. Table 4-7 presents results of various diagnostic tests including the Breusch-Godfrey LM test for autocorrelation, Engle's ARCH LM test and the Breusch-Pagan/Cook-Weisberg test for heteroscedasticity, Jarque-Bera (JB) test for normality of residuals, and the Ramsey Reset test for correct specification of the models. The results show, overall, that the ARDL models do not violate the fundamental assumptions of the classical linear regression model. For model

stability, the plots of the cumulative sum and cumulative sum of squares of the recursive residuals (see Appendix C) indicate that the ARDL models are dynamically stable.

Table 4-7. Diagnostic tests for determinants model (1970-2017)

	total debt model		external debt model		domestic debt model	
	1	2	1	2	1	2
R-squared	0.87	0.82	0.83	0.83	0.90	0.90
BG (χ^2) test	2.505	0.420	0.756	0.938	0.740	0.773
	(0.286)	(0.811)	(0.685)	(0.626)	(0.691)	(0.701)
ARCH LM (χ^2)	0.149	0.288	0.644	0.644	0.673	1.057
	(0.699)	(0.592)	(0.422)	(0.415)	(0.412)	(0.304)
BP (χ^2) test	0.080	0.180	1.440	1.453	0.001	0.010
	(0.775)	(0.667)	(0.230)	(0.216)	(0.957)	(0.940)
JB (χ^2) test	1.684	1.606	2.990	2.877	0.934	0.837
	(0.431)	(0.448)	(0.224)	(0.237)	(0.627)	(0.658)
RESET (χ^2) test	1.160	2.040	1.270	0.990	0.120	0.090
	(0.214)	(0.131)	(0.307)	(0.413)	(0.948)	(0.963)
CUSUM	stable	stable	stable	stable	stable	stable
CUSUM SQ	stable	stable	stable	stable	stable	stable

Note: p-values in parenthesis; BG is the Breusch-Godfrey LM test for higher-order serial correlation; ARCH LM denotes the test for autoregressive conditional heteroscedasticity; BP stands for the Breusch-Pagan/Cook-Weisberg test for heteroscedasticity; JB is the Jarque-Bera normality test; RESET is the Ramsey RESET test for functional form misspecification. See Appendix B for the CUSUM and CUSUM Squared Plots.

4.6.2 Non-linear effects of debt

Turning to the analysis of the debt-growth model, the results from unit root tests also confirm the absence of I(2) variables. The empirical analysis therefore proceeds with the bounds test for co-integration. The results are presented in Table 4C-2 of the Appendix. The findings lead to the rejection of the null hypothesis of non-cointegrating relationship in the models. The F-test statistics for both the total and external debt regressions are each greater than the Pesaran et al. (2001) and Kripfganz & Schneider (2018) upper critical bounds at 1%. This gives strong support for the existence of a long-run relationship in the debt-growth models. Given the foregoing, the next step involves the estimation of the long-run and short-run regressions. Beginning with the long-run model, Table 4-8 presents findings from three separate estimations with total, external, and domestic debt, respectively. Although the focus of this study is on the effects of public debt, it is important to begin by observing that the results on the control variables are generally in line with the growth literature. Public investment as measured by the gross-fixed capital formation, oil price, and trade openness tend to be positive and strongly significant in all three regressions as expected. Population growth also has the expected negative and significant estimate in all the regressions.

Table 4-8. Long-run estimates for debt-growth model (1970-2017)

	Total debt model	External debt model	Domestic debt model
total debt	0.005**		
	(0.002)		
total debt squared	-0.000*		
	(0.000)		
external debt		0.006***	
		(0.002)	
external debt squared		-0.000***	
		(0.000)	
domestic debt			0.026**
			(0.012)
domestic debt squared			-0.001*
			(0.000)
investment/gdp	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)
log population	-6.307**	-13.188***	-10.717***
	(2.368)	(3.716)	(2.399)
trade openness	0.142***	0.110***	0.088**
	(0.029)	(0.028)	(0.036)
log oil price	0.160***	0.227***	0.165***
	(0.026)	(0.043)	(0.028)
financial crisis	0.059***	0.011	0. .009
	(0.020)	(0.029)	(0.025)
trend	0.132**	0.310***	0.256***
	(0.061)	(0.094)	(0.063)
Constant	-133.781	-365.727***	-303.859***
	(78.370)	(120.635)	(81.178)
Observations	44	44	44

Notes: *, **, & *** denote significance at 1%, 5%, and 10% respectively; Robust standard errors in parenthesis.

Turning to the main variable of interest, the results fulfil the necessary condition for the presence of a non-linear effect of public debt on economic growth. This can be seen by observing the positive sign on debt and the negative sign on its squared term, both of which are statistically significant in the total, external, and domestic debt models. The coefficient on the squared term is, however, weakly significant (at 10%) in the total and domestic debt. This makes it important to carry out further tests to verify the presence of a nonlinear effect.

The results of the SLM tests are presented in Table 4C-3 of the Appendix. The total debt model presents a threshold estimate of 56% with an overall SLM test statistic that is, albeit, weakly significant (at the 10% level). The external debt model presents a threshold estimate of 88% with an overall test statistic that is significant at 5%. Regarding the domestic debt model, the evidence of nonlinearity in Table 8 is not supported by the SLM test as indicated by the lack of significance of the overall test statistic.

Thus, for the case of Nigeria, the study leads to the conclusion that total public debt may have a growth-inducing effect only at ratios below 56%. Similarly, external debt may contribute positively to growth at ratios below 88%. By implication public debt levels above these estimated thresholds could have adverse effects on economic growth. The external debt model was estimated to facilitate comparison with previous panel studies where the focus is predominantly on the external debt component. Regarding the existence of a non-linear nexus between public debt and growth, this study lends support to previous panel studies focusing on developing countries in general and SSA in particular (see for example, Elbadawi, Ndulu, & Ndung'u, 1997; Pattillo et al., 2002; Megersa, 2015; Karadam, 2018). The result, however, tend to differ with regard to the threshold estimate. For example, while Karadam (2018), focusing on a panel of developing countries also presents a threshold of 88%, others such as Elbadawi et al. (1997) presents a threshold estimate of 97% using a developing countries' sample but with a focus on SSA countries.

The results of the short-run error correction model are in Table 4-9. Here, the total public debt presents a negative and significant impact on economic performance in the current period, but the first lag of the variable is insignificant. The coefficient on each of the three lags of the dependent variable is positive and strongly significant in all three models. This tends to show that past economic performance has a positive impact on current performance in the short-run. Regarding the non-debt control variables, the results are strongly significant but unlike the long-run regressions, the signs of the variables fail to accord with the expectation.

Investment, trade openness, and oil prices, all have negative economic effects in the short-run. The error correction term presents a negative and statistically significant estimate in all the regressions, thus confirming the evidence of a long-run cointegrating relationship in the models.

Diagnostic tests were performed on the debt-growth models. The results are presented in Table 4-10. For each of the three models, the results show that the assumptions of the classical linear regression model are satisfied. Additionally, both the CUSUM and CUSUMSQ plots lie within the 5% critical bounds, implying that the models are stable (see Appendix C).

Table 4-9. Error-correction representation for debt-growth model (1970-2017)

	Total debt model[a]	External debt model[b]	Domestic debt model[c]
Δtotal debt	-0.002**		
	(0.001)		
Δtotal debt(-1)	-0.001		
	(0.001)		
Δdomestic debt squa			-0.000
			(0.000)
Δlog gdp per capita(-1)	0.610***	0.464***	0.522***
	(0.149)	(0.157)	(0.176)
Δlog gdp per capita (-2)	0.382**	0.254*	0.370**
	(0.141)	(0.134)	(0.147)
Δlog gdp per capita(-3)	0.481***	0.443***	0.472***
	(0.143)	(0.142)	(0.145)
Δinvestiment/gdp	-0.000**	-0.000	
	(0.000)	(0.000)	
Δtrade openness	-0.101***	-0.104***	-0.066*
	(0.030)	(0.033)	(0.037)
Δtrade openness(-1)			0.039
			(0.025)
Δlog oil price	-0.060**	-0.083**	-0.067**
	(0.028)	(0.035)	(0.028)
Δlog oil price(-1)	-0.094***	-0.099***	-0.093***
	(0.026)	(0.030)	(0.026)
constant	-133.781*	-365.727***	-303.859***
	(72.623)	(130.314)	(81.641)
ECM (-1)	-1.142***	-0.880***	-0.851***
	(0.174)	(0.183)	(0.197)

Notes: *, **, & *** denote significance at 1%, 5%, and 10% respectively; Robust standard errors in parenthesis. Lag structures are selected using the AIC criterion as follows:
[a] ARDL(4 2 0 1 1 2 0);
[b] ARDL(4 0 0 1 1 2 0);
[c] ARDL(4 0 1 0 2 2 0)

Table 4-10. Diagnostic tests for debt-growth model

	Total debt model	External debt model	Domestic debt model
R-squared	0.81	0.75	0.71
BG (χ^2) test	0.540	3.146	1.897
	(0.480)	(0.207)	(0.387)
ARCH LM test	0.751	0.202	2.464
	(0.386)	(0.653)	(0.117)
BP (χ^2) test	0.984	2.000	0.050
	(0.371)	(0.157)	(0.817)
JB (χ^2) test	0.947	1.398	3.521
	(0.623)	(0.497)	(0.172)
RESET (χ^2) test	2.440	2.090	0.497
	(0.124)	(0.128)	(0.843)
CUSUM	stable	stable	stable
CUSUM SQ	stable	stable	stable

Note: p-values in parenthesis; BG is the Breusch-Godfrey LM test for higher-order serial correlation; ARCH LM denotes the test for autoregressive conditional heteroscedasticity in the residuals; BP stands for the Breusch-Pagan/Cook-Weisberg test for heteroscedasticity; JB is the Jarque-Bera normality test; RESET is the Ramsey RESET test for functional form misspecification. See Appendix C for the CUSUM and CUSUM Square Plots.

4.7 Conclusion and policy recommendations

This study examined the determinants of public debt as well as the relationship between public debt and economic growth with a focus on the case of Nigeria. The study contributed to the existing literature in three unique ways. First, regarding the causes of public debt, it went beyond the usual focus on macroeconomic factors to consider the influence of socio-political variables. Second, while also focusing individually on the external and domestic debt, the study employed the total public debt for a more representative analysis, given the historical importance of both components of debt in Nigeria. Third, regarding debt-growth nexus, the study focused on examining the non-linear aspects of the relationship.

The empirical analysis of Nigeria's public debt presents some interesting and intuitive findings. On the determinants of public debt, the study found compelling evidence supporting the role of government's fiscal position, inflation, real interest rate, real exchange rate, and conflict in explaining Nigeria's public debt. On the debt-growth nexus, the evidence confirmed the existence of a nonlinear relationship for case of Nigeria as for other developing countries. Moreover, the findings suggest that the effect of debt on growth turns to negative at the threshold of about 56% of GDP for total public debt and 88% for external debt. This implies that debt may only be beneficial for economic growth at ratios below these thresholds. These findings have implications for debt sustainability in Nigeria. Interestingly, with the exception of the real exchange rate, all other significant determinants of public debt are those that are within the control of the government. The government can exercise restraint on spending by ensuring that deficits are created mainly for investments that can guarantee future streams of

income rather than for the purpose of recurrent spending. Similarly, the government can create surpluses or reduce deficits by strengthening its revenue generating capacity. Although this may not a straight-forward solution, it is within government's capacity to seek ways of resolving the persistent problem of conflict in the country given its effect on external debt. Lastly, in view of the non-linear nexus and the estimated thresholds, government can exercise restraint by ensuring that public debt is kept way below the sustainable threshold, as this may have positive growth effects.

Chapter 5

Conclusion and policy recommendations

The rising pace of public debt across the globe in the wake of the global financial crisis has ganered a growing attention of researchers, policymakers, and the public, particularly in recent years. For SSA countries in particular, this constitutes one of the topmost macroeconomic policy issues. Researchers have developed two unique but interrelated strands of this literature, one on the determinants of public debt and the other on the effects of public debt on economic growth. Previous empirical studies on these topics have focused primarily on the advanced and emerging market economies with very limited focus on SSA countries. This thesis contributes to the debate with a focus on SSA countries. By so doing, it takes into account the unique economic, political and institutional variables that are specific to the SSA countries. Broadly, the thesis is made up of three independent but interrelated studies that investigate the drivers and economic growth effects of persistent public debt growth in SSA.

Chapter 1 gives a detailed introduction and background to the study. It draws on the existing literature to give some perspective to the emerging debt problem in African economies using the identified factors underlying the previous crises. It argues that the factors associated with the previous crises are mostly macroeconomic in nature and are usually out of the control of SSA governments. For example, factors such as commodity price shocks, global interest rate, and the easy availability of Eurodollars, are all external to SSA countries and therefore lie out of control when it comes to the quest for debt sustainability. It is in view of the need to account for factors that lie within the control of SSA's governments that this thesis examines the role of socio-political and governance factors in addition to the macroeconomic factors. In particular, socio-political factors like armed conflict, institutional quality and regime-type considered in addition to macroeconomic factors such as growth, exchange rate, and inflation. Further to this, Chapter 1 sets up a basis for the debt-growth study using the known economic effects of the previous crisis. The country-specific study on Nigeria finds its importance in the heterogeneity argument according to which the analysis of public debt is most applicable when carried out at the country level.

The focus of Chapter 2 is to analyse the determinants of public external debt in SSA. The chapter extends the literature by considering the role of conflict and governance variables in addition to the economic variables. Evidence obtained from a variety of panel estimation methods affirm that aside the usual economic factors, armed conflict and goverance variables play a key role in explaining SSA's public debt. Specifically, the study provides compelling

evidence in support of the debt-reducing roles of growth and the measures of governance quality, and the debt-inducing role of conflict.

Chapter 3 investigates the relationship between public debt and economic growth in SSA. The first and main objective of the study is to examine whether a nonlinear nexus exists for SSA countries. The second objective is to determine the threshold estimates of public debt that are sustainable. In addition to these objectives, the study undertakes a comparative analysis of the long-term and short-term public debt in SSA. The study accounts for key empirical issues of simultaneity, homogeneity and cross-section dependence which have often been ignored in the literature, particularly on SSA countries. Evidence from a variety of panel estimation methods shows that the nexus between public debt and growth in SSA is nonlinear. However, threshold estimates seem to vary widely from one estimation method to another and range from 41%-131%. When exogenously determined thresholds are interacted with public debt, it is observed that debt ratios above 30% but below 40% are detrimental for economic growth. Further to this, the study presents some evidence affirming the low debt-carrying capacities of SSA countries. In the comparative analysis of short-term and long-term public debt, the study finds that long-term debt on one hand presents a nonlinear link with growth and gives the idea that large accumulations may be detrimental for growth. On the other hand, rather than a nonlinear nexus, short-term debt presents a linear negative relationship with growth. The absence of a nonlinear link in this case seems to point to the difficulty of determining the amount of debt that may be unsustainable.

Chapter 4 examines both the determinants and economic effects of public debt using a case study of Nigeria. In recent years, researchers, motivated by the lack of consensus in the literature, have increasingly approached the analysis of public debt from a country-specific viewpoint. The focus on the country case of Nigeria is important for two reasons. One is that Nigeria is SSA's most populous and largest economy. The other reason is that Nigeria's public debt has a trend that is quite similar in nature to that of SSA in general. The study makes a number of contributions to the existing literature. First, it considers both the economic and socio-political drivers of public debt. Second, it employs the total debt measure whilst also considering the individual components – external and domestic debt. Third, regarding the debt-growth nexus, the study tests for the existence of a nonlinear relationship and presents threshold estimates, an approach to the debt-growth nexus that has seldom been taken in previous studies on Nigeria.

Regarding the determinants, the evidence suggests that Nigeria's public debt is mainly driven by economic factors, namely government's fiscal position, inflation, the real interest rate, and

the real exchange rate. The socio-political factor, conflict, plays a role, but only in explaining the growth of external debt in Nigeria. On the debt-growth nexus in Nigeria, evidence supports the existence of nonlinear relationship in both the total and external debt models. Threshold estimates, however, differ between the two models: The total debt model presents a threshold of 56% while the external debt model presents a threshold of 88%.

The evidence obtained from each of the three studies have relevant policy implications that can support the effort towards debt sustainability in SSA countries. Regarding the determinants of public debt, most of the significant factors are, interestingly, those that can be classified as internal factors: i.e., factors that lie within the governments' control. SSA's governments can, for example, create conditions that are conducive for sustainable economic growth. Similarly, they can exercise restraint on spending by, among other things, ensuring that borrowing is kept below the sustainable threshold, keeping in mind the low debt-carrying capacities of this set of countries. They can also create surpluses or reduce deficits by strengthening their revenue generating capacity. Given the debt-inducing role of conflict, both in the panel study and in the external debt model of the country case of Nigeria, it is critically important for the governments of SSA countries to seek ways of preventing, resolving, or managing the recurrent problem of armed conflict.

The debt-growth study also has interesting policy implications: The evidence of nonlinearity suggests that borrowing may not go on indefinitely. Overall, the debt-growth study affirms the low debt-carrying capacities of SSA countries. It highlights the need to exercise restraints on the accumulation of public debt by borrowing only for purposes that have the promise of generating future streams of income to support growth and the debt service obligation. Evidence from the comparative analysis of short-term and long-term debt tends to highlight the risk of over-relying on a particular type of debt instrument simply because it is more cheaply available.

When comparing the evidence from the study on Nigeria with the evidence from the panel studies on SSA countries, some interesting observations are made. On the determinants of public debt, we find that whereas conflict and institutional variables are as important to SSA countries as the economic factors, Nigeria's public debt seems to be predominantly driven by the economic factors. Regarding the debt-growth relationship, while the evidence of a nonlinear nexus is common to both the panel and the country case studies, the threshold estimates differ quite considerably between them. We find, in particular, that it is difficult to come up with thresholds estimates that reflect the low debt-carrying capacities of SSA

countries in general. On the other hand, the threshold estimate for the case of Nigeria seems quite realistic in the light of the IMF threshold for low-income countries.

Overall, the evidence from the comparative analysis tends to support the need for more country-specific studies in the public debt literature. This is important because the mix of evidence in the literature is, among other things, attributable to the difficulty of accounting for country-specific nuances within a panel framework. For example, although external and domestic debt have both been problematic for many SSA countries the literature has predominantly focused on the external debt given the difficulty of accessing adequate data on domestic debt. On the other hand, when focusing on an individual country such as Nigeria where external and domestic debt have also both been problematic, it would be unrepresentative to consider only the external debt component. Apart from this, Nigeria is a major oil-exporting country that derives much of its revenues from oil. A country-specific model focusing on Nigeria should therefore account for these nuances which may not be important for other SSA countries. To the extent that these nuances can be more easily accounted in country-case studies, such studies are useful in explaining the the mix of evidence in the public debt literature.

Limitation and opportunities for further research

This thesis is not without its limitations. First and foremost, whereas data quality has improved markedly over the decades, data on SSA African countries is still affected by missing observations which tend to limit the number of countries and years that can be considered. In the future, with the increasing prospects of data improvements in the sub-region, the consideration of more SSA countries over longer time spans can help to improve the quality of empirical analysis. Second, whereas the country case study is limited to the case-study of Nigeria, other country case-studies are also encouraged given the need to localise the analyses of public debt in individual countries.

References

Abbas, A., Belhocine, N., El-Ganainy, A., & Horton, M. (2011). Historical patterns of public debt - evidence from a new database. *IMF Economic Review*, *59*(4), 717–742.

Abbas, A., Belhocine, N., El-Ganainy, A., & Horton, M. (2010). *A historical public debt database* (IMF Working Paper WP/10/245). Washington D.C.: International Monetary Fund.

Abbas, S. A., Akitoby, B., Andritzky, J., Berger, H., Komatsuzaki, T., & Tyson, J. (2014). Reducing public debt when growth is slow. In M. Schindler, H. Berger, B. B. Bakker & A. Spilimbergo (Eds.), *Jobs and growth: Supporting the European recover* (pp. 67–93). Washington D.C.: IMF Institute, International Monetary Fund, Washington, D.C.

Abbas, S. M. A., & Christensen, J. E. (2010). *The role of domestic debt markets in economic growth: An empirical investigation for low-income countries and emerging markets* (IMF Working Paper WP/07/127). Washington D.C.: International Monetary Fund.

Abdullahi, M. M., Bakar, N. A., & Hassan, S. B. (2015). Determining the macroeconomic factors of external debt accumulation in Nigeria: An ARDL bounds test approach. *Procedia - Social and Behavioral Sciences*, *211*, 745–752.

Adamu, I., & Rasiah, R. (2016). *On the determinants of external debt in Nigeria*. Available at: https://doi.org/10.2139/ssrn.2865568

Adegbite, E. O., Ayadi, F. S., & Felix Ayadi, O. (2008). The impact of Nigeria's external debt on economic development. *International Journal of Emerging Markets*, *3*(3), 285–301.

Afolabi, O. S. (2019). Political elites and anticorruption campaigns as 'deep' politics of democracy: A comparative study of Nigeria and South Africa. *Taiwan Journal of Democracy*, *15*(1), 159–181.

Afonso, A., & Jalles, J. T. (2013). Growth and productivity: The role of government debt. *International Review of Economics and Finance*, *25*, 384–407.

Agnello, L., & Sousa. (2009). *The determinants of public deficit volatility* (ECB Working Paper 1042). Frankfurt am Main: European Central Bank.

Ahlborn, M., & Schweickert, R. (2018). Public debt and economic growth – economic systems matter. *International Economics and Economic Policy*, *15*(2), 373–403.

Ajayi, S. I. (1991). *Macroeconomic approach to external debt: The case of Nigeria* (AERC Research Paper 8). Nairobi: African Economic Research Consortium.

Akanbi, O. A. (2016). External debt accumulation in Sub-Saharan African countries: How fast is safe? *International Journal of Sustainable Economy*, *8*(2), 93–110.

Akitoby, B., Komatsuzaki, T., & Binder, A. (2014). *Inflation and public debt reversals in the G7 countries* (IMF Working Paper WP/14/96). Washington D.C.: International Monetary Fund.

Akram, V., & Rath, B. N. (2018). Fiscal sustainability in India : evidence from Markov switching and threshold regression models. *Studies in Economics and Finance*.

Alesina, A., & Perotti, R. (1999). Budget Deficits and Budget Institutions. In J. M. Poterba (Ed.), *Fiscal Institutions and Fiscal Performance* (pp. 13-36). University of Chicago Press.

Alesina, A., Hausmann, R., Hommes, R., & Stein, E. (1999). Budget institutions and fiscal performance in Latin America. *Journal of Development Economics*, *59*, 253–273.

Alesina, A., & Passalacqua, A. (2016). The political economy of government debt. In *Handbook of Macroeconomics* (1st ed., Vol. 2B, pp. 2599–2651). Elsevier

Alesina, A., & Perotti, R. (1995). The political economy of budget deficits. *IMF Staff Papers*, *42*(1), 1–31.

Alesina, A., & Perotti, R. (1996). *Budget deficits and budget institutions* (NBER Working Paper 5556). Cambridge, MA: National Bureau of Economic Research.

Alesina, A., & Drazen, A. (1991). Why are stabilizations delayed. *The American Economic Review*, *81*(5), 1170–1188.

Alesina, A., & Perotti, R. (1995). The political economy of budget deficits. *Palgrave Macmillan*, *42*(1), 1–31.

Alesina, A., Prati, A., & Tabellini, G. (1989). *Public confidence and debt management: A model and a case study of Italy* (NBER Working Paper 3135). Cambridge, MA: National Bureau of Economic Research.

Alesina, A., & Tabellini, G. (1990). A positive theory of fiscal deficits and government debt. *The Review of Economic Studies*, *57*(3), 403–414.

Alfaro, L., & Kanczuk, F. (2007). *Debt maturity: Is long-term debt optimal?* (NBER Working Paper 13119). Cambridge, MA: National Bureau of Ecoomic Research.

Arellano, M., & Bond, S. (1991). Some tests of specificatio for panel data: monte carlo evidence and an application to employment equations. *The Review of Economic Studies*, *58*(2), 277–297.

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, *68*, 29–51.

Asogwa, R. C., & Ezema, C. C. (2005). *Domestic government debt structure, risk characteristics and monetary policy conduct: Evidence from Nigeria*. Research Report submitted for the International Research Project on Macroeconomic Policy Challenges for Low Income Countries. International Monetary Fund.

Atingi-Ego, M. (2019). *Public debt accumulation in SSA: a looming debt crisis*. Paper Presented at the AERC Biannual Plenary: Growing with Debt in African Economies: Options, Challenges and Pitfalls, Cape Town.

Azam, M., & Feng, Y. (2017). Does military expenditure increase external debt? Evidence from Asia. *Defence and Peace Economics*, *28*(5), 550–567.

Babawale, T., Fadahunsi, A., Momoh, A., & Olukoshi, A. (1996). Nigeria beyond structural adjustment: Towards a national popular alternative development strategy. *Africa Development: A Quarterly Journal of CODESRIA*, *21*(2–3), 119–139.

Baldacci, E., Petrova, I., Belhocine, N., Dobrescu, G., & Mazraani, S. (2011). *Assessing fiscal stress* (IMF Working Paper WP/11/100). Washington D.C.: IMF Institute, International Monetary Fund, Washington, D.C.

Baltagi, B. H. (2005). *Econometric Analysis of Panel Data* (3rd Editio). West Sussex, England: John Wiley and Sons.

Baltagi, B. H., Bresson, G., & Pirotte, A. (2008). To pool or not to pool? In L. Matyas & P. Sevestre (Eds.), *The econometrics of panel data: fundamental and recent developments in theory and practice* (pp. 517–546). Springer.

Bandiera, L. (2008). Public debt and its determinants in low income countries. *SSRN Electronic Journal*. Available at: http://ssrn.com/abstract=1143511

Banerjee, A., & Carrion-i-silvestre, J. L. (2017). Testing for panel cointegration using common correlated effects estimators. *Journal of Times Series Analysis*.

Barkbu, B. B., Beddies, C., & Le Manchec, M. H. (2008). *The debt sustainability framework for low-income countries.* (IMF Occasional Papers, 266). Washington D.C.: International Monetary Fund,

Barrett, P. (2018). *The Fiscal Cost of Conflict: Evidence from Afghanistan 2005-2016* (IMF Working Papers, WP/18/204). Washington D.C.: IMF Institute, International Monetary Fund.

Barro, J., & Lee, J. (1994). Sources of economic growth. *Proceedings of the Carnegie-Rochester Conference Series on Public Policy, 40*, 1–46.

Barro, R. J. (1974). Are government bonds net wealth? *Journal of Political Economy*, *82*(6), 1095–1117.

Barro, R. J. (1979). On the determination of public debt. *Journal of Political Economy*, *87*(5), 940–971.

Barro, R. J., & Sala-i-Martin, X. (2004). *Economic growth* (2nd ed). Cambridge, Massachusetts: MIT Press.

Battaile, B., Hernández, F. L., & Norambuena, V. (2015). *Debt sustainability in sub-Saharan Africa: unravelling country-specific risks* (World Bank Working Paper 7523). Washington D.C.: World Bank. Retrieved from World Bank: https://openknowledge.worldbank.org/handle/10986/23622.

Baum, A., Checherita-westphal, C., & Rother, P. (2012). *Debt and growth: New evidence for the Euro Area* (ECB Working Paper 1450). Frankfurt am Main: European Central Bank.

Beaugrand, P., Loko, B., & Mlachila, M. (2002). *The choice between external and domestic debt in financing budget deficits: The case of Central and West African countries* (IMF Working Paper WP/02/79). International Monetary Fund.

Berg, A., Berkes, E., Pattillo, C., Presbitero, A. F., & Yakhshilikov, Y. (2014). *Assessing bias and accuracy in the World Bank- IMF's debt sustainability framework for low-income countries* (IMF Working Paper WP/14/48). Washington DC.: International Monetary Fund.

Berg, A., & Sachs, J. (1988). The debt crisis structural explanations of country performance. *Journal of Development Economics*, *29*(3), 271–306.

Bernheim, B. D. (1987). *Ricardian Equivalence: an evaluation of theory and evidence*

(NBER Working Paper *2*330). Cambridge, MA: National Bureau of Economic Research.

Bernheim, B. D. (1989). A neoclassical perspective on budget deficits. *Journal of Economic Perspectives*, *3*(2), 55–72.

Bildirici, M., & Ersin, O. O. (2007). Domestic debt, inflation and economic crises: a panel cointegration application to emerging and developed economies. *Applied Econometrics and International Development*, *7*(1), 31–47.

Bittencourt, M. (2015). Determinants of government and external debt: Evidence from the young democracies of South America. *Emerging Markets Finance and Trade*, *51*(3), 463–472.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, *87*, 115–143.

Bond, S. R. (2002). Dynamic panel data models : a guide to micro data methods and practice. *Portuguese Economic Journal*, *1*, 141–162.

Borensztein, E., Chamon, M., Jeanne, O., Mauro, P., & Zettelmeyer, J. (2005). *Sovereign debt structure for crisis prevention* (IMF Occasional Paper 234). Washington D.C.: International Monetary Fund.

Bräutigam, D. A., & Knack, S. (2004). Foreign aid, institutions, and governance in Sub-Saharan Africa. *Economic Development and Cultural Change*, *52*(2), 255–285.

Brennan, G., & Buchanan, J. M. (1980). The logic of the ricardian equivalence theorem. *Public Finance Analysis, New Series*, *1*, 4–16.

Breusch, A. T. S., & Pagan, A. R. (1980). The Lagrange Multiplier test and its applications to model specification in econometrics. *The Review of Economic Studies*, *47*(1), 239–253.

Brzoska, M. (1983). The military related external debt of third world countries. *Journal of Peace Research*, *20*(3), 271–277.

Bua, G., Pradelli, J., & Presbitero, A. F. (2014). Domestic public debt in Low-Income Countries : Trends and structure ☪. *Journal of Advanced Research*, *4*(1), 1–19.

Buchanan, J. M., & Wagner, E. W. (1976). *Democracy in deficit: The political legacy of Lord Keynes*. Indianapolis: Liberty Fund.

Buchanan, J. M. (1976). Barro on the Ricardian equivalence theorem. *Journal of Political Economy*, *84*(2), 337–342.

Cameron, A. C., & Trivedi, P. K. (2005). *Microeconometrics: methods and applications*. Cambridge: Cambridge University Press.

Campos, C. F. S., Jaimovich, D., & Panizza, U. (2006). The unexplained part of public debt. *Emerging Markets Review*, *7*(3), 228–243.

CBN. (2019). *Central Bank of Nigeria Statistical Bulletin*. Abuja: Central Bank of Nigeria. Retrieved from the Central Bank of Nigeria: https://www.cbn.gov.ng/documents/Statbulletin.asp.

Cecchetti, S. G., Mohanty, M. S., & Zampolli, F. (2011). *The real effects of debt* (BIS Working Papers 352). Basel: Bank of International Settlements. Retrieved from the Bank of International Settlement: https://www.bis.org/publ/work352.pdf.

Checherita-westphal, C., & Rother, P. (2012). The impact of high government debt on economic growth and its channels : An empirical investigation for the Euro Area. *European Economic Review*, *56*, 1392–1405.

Cherif, R., & Hasanov, F. (2018). Public debt dynamics: the effects of austerity, inflation, and growth shocks. *Empirical Economics*, *54*(3), 1087–1105.

Chudik, A., Mohaddes, K., Pesaran, M. H., & Raissi, M. (2017). Is there a debt-threshold effect on output growth? *Review of Economics and Statistics*, *99*(1) 135-150.

Chudik, A., & Pesaran, M. H. (2015). Common correlated effects estimation of heterogeneous dynamic panel data models with weakly exogenous regressors. *Journal of Econometrics*, *188*(2), 393-420.

Claessens, S. (1990). The Debt Laffer curve: some estimates. *World Development*, *18*(12), 1671–1677.

Clemente, J., Montanes, A., & Reyes, M. (1998). Testing for a unit root in variables with a double change in the mean. *Economic Letters*, *59*, 175–182.

Coakley, J., Fuertes, A., & Smith, R. (2006). Unobserved heterogeneity in panel time series models. *Computational Statistics and Data Analysis*, *50*, 2361–2380.

Cohen, D. (1997). *Growth and external debt: a new perspective on the African and Latin American tragedies* (CEPR Working Papers 9715). London: Centre for Economic Policy Research.

Collier, P., & Gunning, J. W. (1999). Explaining African economic performance. *Journal of Economic Literature, 37*, 64–111.

Collier, Paul. (1999). On the economic consequence of civil war. *Proceedings of Symposium on Trade, Technology, and Growth, Oxford Economic Papers*, *51*(1), 168–183.

Colombo, E., & Longoni, E. (2009). *The politics of external debt in developing countries* (University of Milan-Bicocca Working Papers 176). Milan: Department of Economics, University of Milan-Bicocca. Retrieved from https://journals.sagepub.com/doi/10.1177/2277978720966485

Cooray, A., Dzhumashev, R., & Schneider, F. (2017). How does corruption affect public debt? An empirical analysis. *World Development, 90*, 115–127.

Coulibaly, B. S., Gandhi, D., & Senbet, L. W. (2019). *Is sub-Saharan Africa facing another systemic sovereign debt crisis?* Retrieved from https://www.brookings.edu/wp-content/uploads/2019/04/africa_sovereign_debt_sustainability.pdf

D'Erasmo, P., & Mendoza, E. G. (2018). *History remembered: Optimal sovereign default on domestic and external debt* (NBER Working Papers 25073). Cambridge, MA: National Bureau of Economic Research.

Dabla-Norris, E., Allen, R., Zanna, L., Prakash, T., Kvintradze, E., Lledo, V., … Gollwitzer, S. (2010). *Budget institutions and fiscal performance in low-income countries* (IMF Working Papers WP/10/80). Washington, D.C.: International Monetary Fund.

Danso, A. (1990). The causes and impact of the african debt crisis. *The Review of Black Political Economy*, *19*(1), 5–21.

de Fontenay, P., & Milesi-Ferretti, G. M. (1995). *The role of foreign currency debt in public debt management* (IMF Working Paper WP/95/21). Washington, D.C.: International Monetary Fund.

Decoodt, P. (1986). The debt crisis of the third world: some aspects of causes and solutions. *Columbia Journal of World Business*, *21*(3), 3-9.

Devarajan, S., Gill, I., & Karakülah, K. (2019). *Debt, growth, and stability in Africa: speculative calculations and policy response*. Paper Presented at the AERC Biannual

Plenary: Growing with Debt in African Economies: Options, Challenges and Pitfalls, Cape Town.

Diamond, P. A. (1965). National debt in a neoclassical growth model. *The American Economic Review*, *55*(5), 1126–1150.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*, *74*(366), 427–431.

Dinneya, G. (2006). Democracy, external debt and growth in Nigeria: An impact analysis under a narrow definition of debt-led growth. *Journal of Political Science*, *39*(4), 827–853.

DMO. (2006). *Annual report and statement of accounts*. Abuja: Debt Management Office. Available at https://www.dmo.gov.ng/publications/reports/dmo-annual-report-statement-of-accounts

Doğan, İ., & Bilgili, F. (2014). The non-linear impact of high and growing government external debt on economic growth : A Markov Regime-switching approach. *Economic Modelling*, *39*, 213–220.

Dombi, Á., & Dedák, I. (2019). Public debt and economic growth: what do neoclassical growth models teach us? *Applied Economics*, *51*(29), 3104–3121.

Driscoll, J. C., & Kraay, A. C. (1998). Consistent covariance matrix estimation with spatially dependent panel data. *The Review of Economics and Statistics*, 549–560.

Dunne, J. P., Nikolaidou, E., & Chiminya, A. (2018). Military spending, conflict and external debt in Sub-Saharan Africa. *Defence and Peace Economics*, *30*(4), 462-473.

Dunne, J. P., Perlo-Freeman, S., & Soydan, A. (2004). Military expenditure and debt in small industrialised economies: A panel analysis. *Defence and Peace Economics*, *15*(2), 125–132.

Easterly, W. (2001). Growth implosions and debt explosions: do growth slowdowns cause public debt crises? *The B.E. Journal of Macroeconomics*, *1*(1), 1–16.

Easterly, William, & Levine, R. (1997). Africa's growth tradegy: policies and ethnic divisions. *The Quarterly Journal of Economics*, *112*(4), 1203–1250.

Eaton, J. (1992). *Sovereign debt: a primer*. (World Bank Policy Research Working Paper

855). Washington D.C.: International Economics Department, World Bank.

Eberhardt, M., & Bond, S. (2009). Cross-section dependence in nonstationary panel models: a novel estimator (MPRA Working Paper 17692). Munich: Munich Personal RePEc Archive.

Eberhardt, M. (2012). Estimating panel time-series models with heterogeneous slopes. *The Stata Journal*, *12*(1), 61–71.

Eberhardt, M., & Presbitero, A. F. (2015). Public debt and growth: heterogeneity and non-linearity. *Journal of International Economics*, *97*(1), 45–58.

Eberhardt, Markus, & Teal, F. (2010). *Productivity analysis in global manufacturing production* (University of Oxford Department of Economics Discsussion Papers 515). Oxford: Department of Economics, University of Oxford.

Edo, S. E. (2002). The external debt problem in Africa: A comparative study of Nigeria and Morocco. *African Development Review*, *14*(2), 221–236.

Edo, S., & Ikelegbe, A. (2014). *The Nigerian economy: Reforms, emerging trends and prospects* (CPED Monograph Papers 8). Benin: Centre for Population and Environmental Development.

Égert, B. (2012). *Public debt , economic growth and nonlinear effects*. (OECD Economics Department Working Paper 993. Retrieved from http://dx.doi.org/10.1787/5k918xk8d4zn-en

Eichengreen, B., Hausmann, R., & Panizza, U. (2003). *Currency mismatches, debt intolerance, and original sin* (NBER Working Papers 10036). Cambridge, MA: National Bureau of Economic Research.

Eisl, A. (2017). *Explaining variation in public debt* (MaxPo Discussion Paper 17/1). Paris: Max Planck Science Po Centre on Coping with Instability in Market Societies.

Elbadawi, I. A., Ndulu, B. J., & Ndung'u, N. (1997). Debt overhang and economic growth in sub-Saharan Africa. In Z. Iqbal & R. Kanbur (Eds.), *External Finance for Low-Income Countries* (pp. 49-76.). Washington D.C.: IMF Institute, International Monetary Fund, Washington, D.C.

Elmendorf, Douglas W, & Mankiw, N. G. (1999). Government debt. In J. B. Taylor & M. Woodford (Eds.), *Handbook of Macroeconomics* (pp. 1615–1669). Elsevier Science

B.V.

Engle, R. F., & Granger, C. W. J. (1987). Co-integration and error correction: Representation, estimation, and testing. *Econometrica*, *55*(2), 251–276.

Escolano, J. (2010). *A practical guide to public debt dynamics, fiscal sustainability, and cyclical adjustment of budgetary aggregates* (IMF Technical Notes and Mannuals, 10/02). Washington D.C.: International Monetary Fund.

Essien, S. N., Agboegbulem, N. T. I., Mba, M. K., & Onumonu, O. G. (2016). An empirical analysis of the macroeconomic impact of public debt in Nigeria. *CBN Journal of Applied Statistics, 7*(1a), 124–143.

Ezeani, E. O., & Ezeibe, C. C. (2011). Defence expenditure and national security in Nigeria. In O. Mbachu & A. Aliyusokoto (Eds.), *Nigerian Defence and Security: Policies and Strategies*. Kaduna: Medusa Academic Publishers Limited.

Ezenwe, U. (1993). The African debt crisis and the challenge of development. *Intereconomics, Nomos Verlagsgesellschaft, Baden-Baden*, *28*(1), 35–43.

Fajana, F. O. (1993). *Nigeria's debt crisis* (UNECA Development Research Papers 5). Addis Ababa: United Nations Economic Commission for Africa.

Fole, A. G. (2003). The historical origin of African debt crisis. *Easteran Africa Social Science Research Review*, *19*(1), 59–89.

Forslund, K., Lima, L., & Panizza, U. (2011). The determinants of the composition of public debt in developing and emerging market countries. *Review of Development Finance, 1*, 207–222.

Fosu, A. K. (1996). The impact of external debt on economic growth in sub-Saharan Africa. *Journal of Economic Development*, *21 (1)*, 93–118.

Fosu, A. Kwasi. (1999). The external debt burden and economic growth in the 1980s: evidence from sub-Saharan Africa. *Canadian Journal of Development Studies*, *20*(2), 307–318.

George, S. (1990). *A fate worse than debt: A radical analysis of the Third World debt crisis*. England: Penguin Group.

Ghura, D., & Hadjimichael, M. T. (1996). Growth in sub-Saharan Africa. *IMF Staff Papers*, *43*(3), 605–634. Palgrave Macmillan.

Gill, I. S., & Karakülah, K. (2019). *Is China Helping Africa ?* (Duke Global Working Paper 3). Duke University: Centre for International and Global Affairs. Available at https://ssrn.com/abstract=3364645

Gnangnon, S. K. (2014). Does structural economic vulnerability matter for public indebtedness in developing countries? *Journal of Economic Studies*, *41*(5), 644–671.

Gomez-Puig, M., & Sosvilla-Rivero, S. (2017). *Public debt and economic growth: further evidence for the Euro Area* (ICEI Working Paper WP/09/17). Instituto Complutense de Estudios Internacionales.

Greene, J. (1989). The external debt problem of sub-Saharan Africa. *IMF Staff Papers*, *36*(4), 836–874. Palgrave Macmillan.

Greene, W. H. (2018). *Econometric analysis* (8th ed). New York: Pearson.

Guidolin, M., & Ferrara, E. La. (2010). The economic effects of violent conflict: Evidence from asset market reactions. *Journal of Peace Research*, *47*(6), 671–684.

Guillaumont, P., Jeanneney, S. G., & Brun, J.-F. (1999). How instability lowers African growth. *Journal of African Economies*, *8*(1), 87–107.

Gyimah-brempong, A. K., & Munoz De Camacho, S. (1998). Political instability, human capital, and economic growth in Latin America. *Journal of Developing Areas*, *32*(4), 449–466.

Habib, M. M., Mileva, E., & Stracca, L. (2017). The real exchange rate and economic growth: Revisiting the case using external instruments. *Journal of International Money and Finance*, *73*(1921), 386–398.

Hall, G. J., & Sargent, T. J. (2011). Interest rate risk and other determinants of post-WWII US government Debt/GDP dynamics. *American Economic Journal: Macroeconomics*, *3*(3), 192–214.

Hammadi, A., Mills, M., Sobrinho, N., Thakoor, V., & Velloso, R. (2019). *A governance dividend for sub-Saharan Africa* (IMF Working Papers WP/19/1). Washington D.C.: International Monetary Fund.

Haynes, J., Parfitt, T. W., & Riley, S. (1987). Debt in Sub-Saharan Africa: the local politics of stabilization. *African Affairs*, *86*(344), 343–366.

Hoechle, D. (2007). Robust standard errors for panel regressions with cross-sectional

dependence. *The Stata Journal*, *7*(3), 281–312.

Horrigan, B. R. (1986). The determinants of the public debt in the United States, 1953-1978. *Economic Inquiry*, *24*, 11–23.

Hoyos, R. E., & Sarafidis, V. (2006). Testing for cross-sectional dependence in panel-data models. *The Stata Journal*, *6*(4), 482–496.

Ijeoma, N. (2014). Impact of Cost of Conflict on Economic Development in Nigeria. *International Journal of Open Scientific Research*, *2*(1), 13–31.

IMF. (2001). Guidelines for public debt management. Retrieved from International Monetary Fund Staff Papers: https://www.imf.org/external/np/mae/pdebt/2000/eng/index.htm

IMF. (2015). *Public debt vulnerabilities in low-income countries: The evolving landscape* (IMF Policy Papers). International Monetary Fund. Retrieved from https://www.imf.org/external/np/pp/eng/2015/110215.pdf

IMF. (2017). *Sub-Saharan Africa: fiscal adjustment and economic diversification*. IMF Regional Economic Outlook. Available at https://doi.org/10.1355/9789814379816-019

IMF. (2018a). *Guidance note on the Bank-Fund debt sustainability framework for low income countries* (IMF Policy Papers). International Monetary Fund. Retrieved from https://doi.org/10.5089/9781498307260.007

IMF. (2018b). *Sub-Saharan Africa: capital flows and the future of work*. IMF Regional Economic Outlook. Available at https://www.imf.org/en/Publications/REO/SSA/Issues/2018/09/20/sreo1018

IMF. (2019). *Sub-Saharan Africa: recovery amid elevated uncertainty*. IMF Regional Economic Outlook. Available at https://www.imf.org/en/Publications/REO/SSA/Issues/2019/04/01/sreo0419

Iyoha, M. (1999). *External debt and economic growth in sub-Saharan African countries: an* Iyoha *econometric study* (AERC Research Paper 90). Nairobi: African Economic Research Consortium.

Javid, A. Y., Arif, U., & Arif, A. (2011). Economic, political determinants of budget deficits volatility in selected Asian countries. *The Pakistan Development Review*, *50*(4), 649–662.

Jibir, A., & Aluthge, C. (2019). Modelling the determinants of government expenditure in

Nigeria. *Cogent Economics and Finance*, *7*(1), 1–23.

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, *12*(2–3), 231–254.

Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration — With applications to the demand for money. *Oxford Bulletin of Economics and Statistics*, *52*(2), 169–210.

Judson, R. A., & Owen, A. L. (1999). Estimating dynamic panel data models: a guide for macroeconomists. *Economic Letters*, *65*, 9–15.

Kalu, K. A. (1996). Political economy in Nigeria: The military, ethnic politics and development. *International Journal of Politics, Culture and Society*, *10*(2), 229–247.

Karadam, D. Y. (2018). An investigation of nonlinear effects of debt on growth. *The Journal of Economic Asymmetries*, *18*, 1–13.

Kaufmann, D., Kraay, A., & Mastruzzi, M. (2011). The worldwide governance indicators: methodology and analytical issues. *Hague Journal on the Rule of Law*, *3*, 220–246.

Keita, L. (2016). Models of economic growth and development in the context of human capital investment - the way forward for Africa. *Africa Development*, *41*(1), 23–48.

Kew, D., & Kwaja, C. M. A. (2013). Development strategies and conflict in Nigeria. In W. Ascher & N. Mirovitskaya (Eds.), *The economic roots of conflict and cooperation in Africa* (pp. 167–182). Palgrave Macmillan.

Kirchgassner, G. (2001). *The effects of fiscal institutions of public finance: a survey of the empirical evidence* (CESifo Working Papers 617). Munich: Centre for Economic Studies and ifo Institute for Economic Research.

Kiviet, J. F. (1995). On bias, inconsistency, and efficiency of various estimators in dynamic panel data models. *Journal of Econometrics*, *68*, 53–78.

Kourtellos, A., Stengos, T., & Tan, C. M. (2013). The effect of public debt on growth in multiple regimes. *Journal of Macroeconomics*, *38*, 35–43.

Kripfganz, S., & Schneider, D. C. (2018). *ardl: Estimating autoregressive distributed lag and equilibrium correction models*. Paper Presented at the London Stata Conference, London. Available at http://repec.org/usug2018/uk18_Kripfganz.pdf

Krugman, P. (1988). *Financing vs. forgiving: a debt overhang* (NBER Working Papers. 2486). Cambridge, MA: National Bureau of Economic Research.

Krumm, K. L. (1985). *The external debt of Sub-Saharan Africa: Origins, magnitude, and implications for action* (World Bank Staff Working Papers 741). Washington D.C.: World Bank.

Kumar, M. S., & Woo, J. (2010). *Public debt and growth* (IMF Working Papers WP/10/174). Washington D.C.: International Monetary Fund.

Kwiatkowski, D., Phillips, P. C. B., Schmidt, P., & Shin, Y. (1992). Testing the null hypothesis of stationarity against the alternative of a unit root. *Journal of Econometrics, 54*, 159–178.

Lind, J. T., & Mehlum, H. (2010). With or without U? The appropriate test for a U-shape relationship. *Oxford Bulletin of Economics and Statistics*, *72*(1), 0305–9049.

Lof, M., & Malinen, T. (2014). Does sovereign debt weaken economic growth? A panel VAR analysis. *Economics Letters*, *122*(3), 403–407.

Looney, R. E. (1987). Determinants of Third World mineral-oil economies external debt. *Journal of Economic Development*, *12*(2), 39–56.

Lucas, R. E., & Stokey, N. L. (1983). Optimal fiscal and monetary policy in an economy without capital. *Journal of Monetary Economics, 12*(1), 55–93.

Mba, P. N., Yuni, D. N., & Oburota, C. S. (2013). Analysis of domestic debt: Implication for economic growth in Nigeria. *Global Journal of Social Sciences, 12*(1), 1–9.

Megersa, K. A. (2015). The laffer curve and the debt-growth link in low-income sub-Saharan African economies. *Journal of Economic Studies*, *42*(5), 878-892.

Melina, G., & Portillo, R. (2018). *Economic fluctuations in sub-Saharan Africa* (IMF Working Papers WP/18/40). Washington D.C.: International Monetary Fund.

Minea, A., & Parent, A. (2012). *Is high public debt always harmful to economic growth? Reinhart and Rogoff and some complex nonlinearities*. Available at https://halshs.archives-ouvertes.fr/halshs-00700471

Modigliani, F. (1961). Long-run implications of alternative fiscal policies and the burden of the national debt. *The Economic Journal, 71*(284), 730–755.

Mupunga, N., & Ngundu, T. (2020). *Escalating public debt levels and fiscal responses in sub-Saharan African countries* (AERC Research Paper 385). Nairobi: African Economic Research Consortium.

Narayan, K. P. (2004). Fiji's tourism demand: the ARDL approach to cointegration. *Tourism Economics*, *10*(2), 193–206.

Narayan, P. K., & Narayan, S. (2008). Does military expenditure determine Fiji's exploding debt levels? *Defence and Peace Economics*, *19*(1), 77–87.

Ncube, M., & Brixiová, Z. (2015). Public debt sustainability in Africa: Building resilience and challenges ahead. *Development Policy Review*, *33*(5), 555–580.

Ndikumana, L. (2001). *Fiscal policy, conflict, and reconstruction in Burundi and Rwanda* (UNU-WIDER Discussion Paper 2001/62). Helsinki: United Nations University World Institute of Development Economics Research.

Ndoricimpa, A. (2020). Threshold effects of public debt on economic growth in Africa : A new evidence. *Journal of Economics and Development*, *22*(2), 187–207.

Ndulu, B. J., & Connell, S. A. O. (2019). *Africa's Development Debts*. Paper Presented at the AERC Biannual Plenary: Growing with Debt in African Economies: Options, Challenges and Pitfalls, Cape Town.

Nguyen, V. B. (2015). The relationship between public debt and inflation in developing countries: empirical evidence based on difference panel GMM. *Asian Journal of Empirical Research*, *5*(9), 102–116.

Nickell, S. (1981). Biases in dynamic models with fixed effects. *Econometrica*, *49*(6), 1417–1426.

Nyatepe-Coo, A. A. (1993). External disturbances, domestic policy responses and debt accumulation in Nigeria. *World Development*, *21*(10), 1621–1631.

Oatley, T. (2010). Political institutions and foreign debt in the developing world. *International Studies Quarterly*, *54*(1), 175–195.

Ogunyemi, A. O. (2008). *Federal budgets in Nigeria, 1954-1999: A history of the processess, policies and problems* (Doctoral Dissertation, University of Lagos, Lagos, Nigeria). Retrieved from http://ir.unilag.edu.ng:8080/handle/123456789/4439?show=full

Ogunyemi, A. O. (2011). Rethinking the origin of Nigeria's debt burden: A historical

reconstruction. *Journal of the Historical Society of Nigeria, 20*, 26–44.

Ohiomu, S. (2020). External debt and economic growth nexus: Empirical evidence from Nigeria. *The American Economist, 65*(2), 330-343.

Okonjo-Iweala, N., Soludo, C. C., & Muhtar, M. (2003). *The debt trap in Nigeria: Towards sustainable debt strategy.* Trenton, NJ: Africa World Press, inc.

Olabisi, M., & Stein, H. (2015). Sovereign bond issues: do African countries pay more to borrow? *Journal of African Trade, 2*(1–2), 87–109.

Olson, M. (1993). Dictatorship, democracy and development. *The American Political Science Review*, *87*(3), 567–576.

Omotola, J. S., & Saliu, H. (2009). Foreign aid, debt relief and Africa's development : problems and prospects. *South African Journal of International Affairs, 16*(1), 87–102.

Omotosho, B. S., Bawa, S., & Doguwa, S. I. (2016). Determining the optimal public debt threshold for Nigeria. *CBN Journal of Applied Statistics, 7*(2), 1–25.

Onafowora, O., & Owoye, O. (2019). Impact of external debt shocks on economic growth in Nigeria : a SVAR analysis. *Economic Change and Restructuring*, *52*(2), 157–179.

OPEC (2020). The new OPEC reference basket. Available at: https://www.opec.org/opec_web/en/data_graphs/40.htm

Ozler, S., & Tabellini, G. (1991). *External debt and political instability* (NBER Working Paper 3772). Cambride, MA: National Bureau of Economic Research.

Pani, M. (1996). Corruption and public debt: can a financial crisis result from dishonest political control? *Journal of Economists and Annals of Economics*, *55*(1), 117–132.

Panizza, U., & Presbitero, A. F. (2013). Public debt and economic growth in advanced economies: a survey. *Swiss Journal of Economics and Statistics, 149*, 175–204.

Panizza, U., & Presbitero, A. F. (2014). Public debt and economic growth: is there a causal effect? *Journal of Macroeconomics*, *41*, 21–41.

Parfitt, T. W., & Riley, S. P. (2014). *The African debt crisis* (Vol. 16). New York: Routledge.

Passarelli, F., & Tabellini, G. (2017). Emotions and political unrest. *Journal of Political Economy*, *125*(3), 903–946.

Pattillo, C., Poirson, H., & Ricci, L. (2002). External debt and growth. (IMF Working Paper WP/02/69). Washington D.C.: International Monetary Fund.

Perron, B. Y. P. (1989). The great crash, the oil price shock, and the unit root hypothesis. *Econometrica*, *57*(6), 1361–1401.

Perron, P. (1990). Testing for a unit root in time series with a changing mean. *Journal of Business and Economic Statistics*, *8*(2), 153–162.

Perron, P., & Vogelsang, T. J. (1992). Nonstationarity and level shifts with an application to purchasing power parity. *Journal of Business and Economic Statistics*, *10*(3), 301–320.

Persson, T., & Svensson, L. E. (1989). Why a stubborn conservative would run a deficit: policy with time-consistent preference. *The Quarterly Journal of Economics*, *104*(2), 325–345.

Pesaran, M. H. (2006). Estimation and inference in large heterogeneous panels with a multifactor error structure. *Econometrica*, *74*(4), 967–1012.

Pesaran, M. H., & Shin, Y. (1999). An autoregressive distributed lag modelling approach to cointegration analysis. *Econometric Society Monographs*, *31*(7), 371–413.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16*(3), 289–326.

Pesaran, M. H., Shin, Y., & Smith, R. P. (1999). *Bounds testing approaches to the analysis of long run relationships* (Cambridge Working Papers in Economics 9907). Faculty of Economics, University of Cambridge.

Pesaran, M. H., & Smith, R. (1995). Estimating long-run relationships from dynamic heterogeneous panels. *Journal of Econometrics*, *68*(1), 79–113.

Pesaran, M. H., Shin, Y., & Smith, R. P. (1999). Pooled mean group estimation of dynamic heterogeneous panels. *Journal of the American Statistical Association*, *94*(446), 621.

Pesaran, M. H., & Zhou, Q. (2017). To pool or not to pool: revisited. *Oxford Bulletin of Economics and Statistics*, 0305–9049.

Phillips, P. C. B., & Ouliaris, S. (1990). Asymtotic properties of residual based tests for cointegration. *Econometrica*, *58*(1), 165–193.

Phillips, P. C. B., & Perron, P. (1988). Testing for a unit root in time series regression.

Biometrica, *75*(2), 335–346.

Rahman, N. H. A., Ismail, S., & Ridzuan, A. R. (2019). How does public debt affect economic growth ? A systematic review. *Cogent Business and Management*, *6*.

Reinhart, C. M., & Rogoff, K. S. (2010). Growth in a time of debt. *American Economic Review*, *39*(8), 573–578.

Reinhart, C. M., Rogoff, K. S., & Savastano, M. A. (2003). Debt intolerance. *Brookings Papers on Economic Activity*, *2003*(1), 1–62.

Reinhart, C. M., Reinhart, V. R., & Rogoff, K. S. (2012). Public debt overhangs: advanced economy episodes since 1800. *Journal of Economic Perspectives*, *26*(3), 69–86.

Reinhart, C. M., & Sbrancia, M. B. (2015). *The liquidation of government debt* (IMF Working Paper WP/15/7). Washington D.C.: International Monetary Fund.

Romero-Barrutieta, A. L., Bulir, A., & Rodríguez-Belgado, J. D. (2015). The dynamic implications of debt relief for low-income countries. *Review of Development Finance*, *5*, 1–12.

Roodman, D. (2009). How to do xtabond: an introduction to difference and system GMM in Stata. *The Stata Journal*, *9*(1), 86–136.

Roubini, N., & Sachs, J. D. (1989). Political and economic determinants of budget deficits in the industrial democracies. *European Economic Review*, *33*(5), 903–933.

Sachs, J. D. (1989). Developing country debt and economic performance. In *The international financial system.* National Bureau of Economic Research, Inc.

Sachs, J. D., & Warner, A. M. (1995). Natural resource abundance and economic growth. In *NBER Working Paper No 5398* (Vol. 3).

Sachs, J., & Huizinga, H. (1987). U.S. Commercial Banks and the developing-country debt crisis. *Brookings Papers on Economic Activity*, *2*, 555–606.

Sasabuchi, S. (1980). A test of a multivariate normal mean with composite hypothesis determined by linear inequalities. *Biometrika*, *67*(2), 429–439.

Saungweme, T., & Odhiambo, N. M. (2018). The impact of public debt on economic growth: A review of contemporary literature. *Review of Black Political Economy*, *45*(4), 339–357.

Serneels, P., & Verpoorten, M. (2012). *The impact of armed conflict on economic performance: Evidence from Rwanda* (IZA Discussion Papers 6737). IZA Institute of Labour Economics. Available at http://ftp.iza.org/dp6737.pdf

Singer, H. W., & Soumitra, S. (1989). Growth and external debt management. In H. W. Singer & S. Soumitra (Eds.), *Growth and external debt management* (1st ed.). New York: Palgrave Macmillan.

Sinha, P., Arora, V., & Bansal, V. (2011). *Determinants of public debt for middle and high income group countries using panel data regression* (MPRA Paper 32079). Munich: Munich Personal REPec Archive. Retrieved from https://mpra.ub.uni-muenchen.de/32079/

Swamy, V. (2015). *Government debt and its macroeconomic determinants - An empirical investigation* (MPRA Paper 64106). Munich: Munich Personal REPec Archive. Available at https://mpra.ub.uni-muenchen.de/64106/

Szabo, Z. (2013). The effect of soveregin debt on economic growth and economic development. *Public Finance Analysis, New Series*, *58*(3), 251–270.

Tabellini, B. G., & Alesina, A. (1990). Voting on the budget defict. *The American Economic Review*, *80*(1), 37–49.

Taiwo, I. O. (1988). An econometric analysis of federal government deficit/surplus in Nigeria. *African Review of Money Finance and Banking*, *1*, 55–69.

Taiwo, I. O. (1989). Determinants of federal government expenditure in Nigeria. *Social and Economic Studies*, *38*(3), 205–222.

Tarek, B. A., & Ahmed, Z. (2017). Institutional quality and public debt accumulation: An empirical analysis. *International Economic Journal*, *31*(3), 415–435.

The World Bank. (1994). *Nigeria - Structural adjustment program : Policies, implementation, and impact*. Retrieved from http://documents.worldbank.org/curated/en/959091468775569769/Nigeria-Structural-adjustment-program-policies-implementation-and-impact

Umoh, O. J., Onye, K. U., & Atan, J. A. (2018). *Political and institutional determinants of fiscal policy persistence in West Africa* (MPRA Paper 88452). Munich: Munich Personal RePEc Archive. Available at https://mpra.ub.uni-

muenchen.de/88452/1/MPRA_paper_88452.pdf

UNDP. (2016). *Primary commodity booms and busts: emerging lessons from sub-Saharan Africa*. United Nations Development Program - Regional Bureau for Africa.

Uzun, A., Karakoy, C., Kabadayi, B., & Emsen, O. S. (2012). The impacts of external debt on economic growth in transition economies. *Chinese Business Review*, *11*(5), 491–499.

Velasco, A. (1997). A model of endogenous fiscal deficits and delayed fiscal reforms. *NBER Working Paper, No. 6336*.

Weingast, B. R., Shepsle, K. A., & Johnsen, C. (1981). The political economy of benefits and costs: a neoclassical approach to distributive politics. *Journal of Political Economy*, *89*(4), 642–664.

WDI. (2019). *World Development Indicators.* Available at: *https://databank.worldbank.org/source/world-development-indicators*

WDI. (2020). *World Development Indicators.* Available at: *https://databank.worldbank.org/source/world-development-indicators*

Willett, S. (2009). Defence expenditures, arms procurement and corruption in sub-Saharan Africa. *Review of African Political Economy*, *36*(121), 335–351.

Woo, J. (2003). Economic , political , and institutional determinants of public deficits. *Journal of Public Economics*, *87*, 387–426.

Woo, J. (2005). Social polarization, fiscal instability and growth. *European Economic Review*, *49*, 1451–1477.

Yeh, S. S. (2011). Corruption and the rule of law in Sub-Saharan Africa. *African Journal of Legal Studies*, *4*, 187–208.

Appendix

Appendix A: Appendix to Chapter 2

Table 2A-1. Principal component analysis

Variable	Eigenvalue	Proportion	Cummulative
1st component	3.461	0.865	0.865
2nd component	0.312	0.078	0.944
3rd component	0.127	0.032	0.975
4th component	0.098	0.025	1.000

Coefficient loadings

	first compoent
ccor	0.5057
polstab	0.5049
regqual	0.5160
rule	0.4723

Note: a principal component is chosen using the criterion that it must have an eigenvalue >=1.

Appendix B: Appendix to Chapter 3

Table 3B-1. Cross-sectional dependence test

	1	2	3
c-d test			
Breusch-Pagan (LM) test	400.701***	1094.123***	-
	(0.000)	(0.000)	-
Pesaran C-D test	-3.257***	-3.518***	-1.901*
	0.0011	0.0004	(0.057)

Note: *, ** and *** denote significance at 10%, 5% and 1%; P-values in parenthesis. The test is conducted under the null hypothesis that panels are cross-sectionally independent. Columns 1-3 present evidence using the baseline annual data, 5-years overlapping averages and 5-years non-overlapping averages, respectively.

Table 3B-2. Linear regression results

	Fixed effects results			SGMM	Mean group regressions	
	1	2	3	4	5	6
Independent variables						
log gdp per capita	-6.336***	-0.682	-0.727	-1.620**	-0.863	-5.343***
	(1.597)	(0.997)	(0.829)	(0.780)	(3.800)	(1.002)
gross govt debt	0.012	0.005	0.005	-0.020	0.006	-0.019
	(0.010)	(0.004)	(0.005)	(0.012)	(0.020)	(0.032)
Investment/gdp	-0.031	0.004	0.025	-0.041	0.209	-8.613
	(0.038)	(0.034)	(0.018)	(0.064)	(0.144)	(6.773)
population growth	0.066	0.090	0.753**	0.517	3.626	0.147
	(0.536)	(0.152)	(0.348)	(0.654)	(3.160)	(0.123)
terms of trade	0.013*	0.010*	0.009	-0.008	0.055**	0.060
	(0.006)	(0.006)	(0.008)	(0.007)	(0.027)	(0.054)
trade openness	0.042**	0.030**	0.034*	0.155**	0.075	0.054
	(0.016)	(0.012)	(0.018)	(0.072)	(0.066)	(0.041)
broad money	-0.046	-0.095***	-0.062***	-0.044	-0.258***	0.105
	(0.043)	(0.022)	(0.021)	(0.038)	(0.086)	(0.239)
conflict	-0.604	-0.869***	-0.241	0.686	-1.710*	-0.499
	(0.579)	(0.275)	(0.422)	(1.079)	(0.930)	(0.436)
executive constraint	0.341**	0.317***	0.221	0.339	0.444	-1.047*
	(0.125)	(0.089)	(0.163)	(0.219)	(0.616)	(0.563)
constant	40.270***	3.969	1.187	3.831	-14.823	44.789
	(9.582)	(6.854)	(5.714)	(4.287)	(27.106)	(84.444)
Obs.	824	840	192	192	840	824

Note: *, **, and *** denote significance at 10%, 5% and 1% respectively. Columns 1-3 present fixed effects regressions using all three variants of the dataset namely the baseline annual data, the cumulative 5-year overlapping averages, and the 5-year non-overlapping averages respectively. System GMM regression (see column 4) has been estimated using the 5-year non-overlapping data while the mean group and common correlated effects regression presented in columns 5 and 6, respectively, employ the baseline annual dataset.

Table 3B-3. Results for linear estimation with long-term debt and nonlinear estimation with short-term debt

	Long-term debt				Short-term debt			
	Fixed effects results			SGMM	Fixed effects results			SGMM
	1	2	3	4	5	6	7	8
Independent variables								
log gdp per cap	-6.381***	-2.620***	-0.459	-6.591*	4.023**	-0.137	0.0151	-0.795
	(1.691)	(0.734)	(0.806)	(3.459)	(1.655)	(0.921)	(0.703)	(0.576)
extshort					-11.468	-11.43	-13.70	-41.040
					(7.825)	(7.826)	(12.35)	(30.498)
extshort square					2.258	22.43	19.63	71.343
					(22.501)	(19.15)	(29.83)	(86.374)
extlong	0.917	0.468	-0.595	-0.220				
	(1.217)	(0.459)	(0.876)	(6.021)				
investment/gdp	-0.026	0.014	0.028	-0.345	-0.020	0.00172	0.0187	-0.034
	(0.040)	(0.036)	(0.021)	(0.327)	(0.037)	(0.0356)	(0.0226)	(0.051)
pop. growth	0.050	0.052	0.745*	0.369	0.154	0.0607	0.715*	0.344
	(0.533)	(0.149)	(0.372)	(1.107)	(0.379)	(0.184)	(0.412)	(0.740)
terms of trade	0.011*	0.012**	0.006	-0.004	-0.007	0.00577	0.00369	-0.009
	(0.007)	(0.004)	(0.008)	(0.021)	(0.008)	(0.00513)	(0.00687)	(0.006)
trade openness	0.040**	0.024**	0.035*	0.642***	0.032	0.0334**	0.0382*	0.112*
	(0.016)	(0.010)	(0.020)	(0.185)	(0.025)	(0.0123)	(0.0207)	(0.057)
broad money	-0.050	-0.095***	-0.063***	-0.251**	-0.105***	-0.0892***	-0.0536**	-0.029
	(0.046)	(0.026)	(0.021)	(0.113)	(0.020)	(0.0229)	(0.0247)	(0.038)
conflict	-0.540	-0.523	-0.017	1.774	-1.224***	-0.946***	-0.319	0.090
	(0.641)	(0.367)	(0.464)	(2.384)	(0.367)	(0.307)	(0.364)	(0.827)
executive const.	0.374***	0.303***	0.212	0.939	0.100	0.267**	0.165	0.252
	(0.132)	(0.100)	(0.161)	(1.339)	(0.117)	(0.114)	(0.158)	(0.255)
constant	40.888***	17.814***	-0.126	15.667	-25.455**	1.087	-2.920	1.336
	(10.158)	(5.084)	(5.616)	(17.826)	(11.665)	(6.513)	(4.747)	(3.056)
Number of obs	810	807	190	190	848	840	192	192

Note: *, **, and *** denote significance at 10%, 5% and 1% respectively. Standard errors in parenthesis. Respectively, columns 1-3 and 5-7 represent fixed effects estimations from the baseline annual data, the 5-year overlapping, and 5-year non-overlapping averages both for long-term and short-term debt regressions, respectively. Columns 4 and 8 present the system GMM results for the long-term debt model and short-term debt model respectively. A-B test is the Arellano-Bond test for 2nd order autocorrelation; Hansen test is the test for overidentifying restriction. The results show that long-term debt is not significant in its linear form and that short term debt is not significant in the non-linear model. Therefore, the study considered the non-linear model for the long-term debt, and the linear form for short term debt.

Table 3B-4. SLM test for non-linearity (gross government debt)

	Fixed Effects			System GMM	Mean Group	Common Corr. Eff.
	1	2	3	4	5	6
H0: monotone or U-shape vs H1: inverse U						
Lower bound slope	0.047***	0.033***	0.032***	0.375***	0.145**	0.155**
	(0.001)	(0.001)	(0.002)	(0.003)	(0.040)	(0.029)
Upper bound slope	-0.053**	-0.030***	-0.039**	-0.625***	-0.880**	-0.958**
	(0.048)	(0.005)	(0.011)	(0.006)	(0.012)	(0.022)
Overall test stat	1.73**	2.82***	2.46**	2.73***	1.75**	1.90**
	(0.048)	(0.005)	(0.011)	(0.003)	(0.041)	0.029
Turning point	126.56	131.65	108.43	92.45	41.81	41.1
90% interval (Fieller)	[54.9; 191.2]	[103.7; 174]	[71.2; 120.4]	[69.5; 131.7]	[9.46; 76.03]	[14.66; 93.08]
Data range	5.04; 264.4	7.92; 232.10	8.62; 232.10	8.62; 232.10	5.04; 264.4	5.04; 264.443

Note: *, **, & *** denote significance at 10%, 5% and 1% respectively; p-values in parenthesis; confidence intervals in square brackets; Columns 1-3 show the fixed effects results using the baseline annual data, the 5-year overlapping, and 5-year non-overlapping averages, respectively; Columns 4-6 present the system GMM, mean group, and common correlated effects estimations, respectively.

Table 3B-5. SLM test for nonlinearity (long-term debt)

	(1) fe_baseline	(2) sgmm	(3) mg
Lower bound slope	0.032**	0.148**	0.044
	(0.011)	(0.010)	(0.230)
Upper bound slope	-0.053**	-0.285***	-0.864**
	(0.036)	(0.007)	(0.011)
t-value	1.88	2.48**	0.74
	(0.036)	(0.010)	(0.230)
Turning point	115	68.60	16.32
90% interval (Fieller method)	[59.97; 216.74]	43.08; 93.77	[-33.99; 42.85]
Data range	3.38; 270.82	1.87; 197.4	[3.38; 270.82]

Notes: *, **, and *** denote significance at 10%, 5%, and 1% respectively; p-values in parenthesis; confidence intervals in square brackets; fe_baseline, and mg denote the fixed effects and mean group estimates using the baseline annual dataset while sgmm is the system GMM regression using the 5-year non-overlapping averages. The SLM test is not applied to the common correlated effects regression as the debt variables are not significant in this case.

Table 3B-6. Regression including both long-term and short-term debt

	Fixed effects results			sgmm
	1	2	3	4
log gdp per capita	-6.258***	-3.499***	-0.639	-2.376*
	(1.917)	(0.717)	(0.885)	(1.239)
extshort	-7.932*	-4.104	-8.503*	-4.433
	(4.156)	(2.448)	(4.129)	(12.593)
extlong	2.347**	1.043**	1.149*	-0.024
	(1.082)	(0.501)	(0.615)	(3.275)
investment/gdp	-0.013	0.003	0.009	-0.096
	(0.034)	(0.036)	(0.033)	(0.078)
terms of trade	0.009	0.012**	0.007	-0.002
	(0.007)	(0.005)	(0.008)	(0.012)
trade openness	0.050***	0.028***	0.037	0.239***
	(0.015)	(0.009)	(0.024)	(0.072)
broad money	-0.050	-0.116***	-0.054*	-0.081
	(0.042)	(0.037)	(0.027)	(0.053)
conflict	-0.643	-0.590	-0.489	0.962
	(0.497)	(0.355)	(0.504)	(1.031)
executive constraints	0.191	0.272**	0.224	0.454
	(0.157)	(0.117)	(0.197)	(0.405)
constant	34.195***	18.758***	-5.454	4.448
	(11.228)	(4.968)	(8.794)	(7.795)
Rsquared-within	0.19	0.35	0.29	
Wald test of equality	5.70**	3.74*	4.97**	0.9
	[0.025]	[0.065]	[0.035]	[0.70]
A-B test (p-val)				0.39
Hansen test (p-val)				0.187
No of observations	840	816	192	192

Note: *, **, and *** denote significance at 10%, 5% and 1% respectively. Standard errors are in parenthesis; fixed effects employ the Driscoll and Kraay standard errors; p-values are in squared brackets; Respectively, columns 1-3 represent the fixed effects estimations using the baseline annual data, the cumulative 5-year overlapping, and 5-year non-overlapping averages; column 4 presents the system GMM regression that reports the A-B test i.e., Arellano-Bond test for 2nd order autocorrelation, and Hansen test for overidentifying restrictions. The sgmm estimation employs the 5-year non-overlapping averages.

Appendix C: Appendix to Chapter 4

Table 4C-1. Bounds test results for determinants model

	total debt model		external debt model		domestic debt model	
	1	2	1	2	1	2
F statistic	15.298***	11.582***	7.254***	7.235***	20.096***	19.699***
k	6	6	6	6	6	6
PSS (2001) lower and upper critical bounds at 1%: Case 5 - Unrestricted intercept, unrestricted trend						
I(0)	3.60	3.60	3.60	3.60	3.60	3.41
I(1)	4.90	4.90	4.90	4.90	4.90	4.68
KS (2018) lower and upper critical bounds at 1%: Case 5 - Unrestricted intercept, unrestricted trend						
I(0)	4.437	4.399	4.435	4.435	4.049	4.049
I(1)	6.521	6.328	6.475	6.475	6.007	6.007

Notes: *, **, & *** denote significance at 10%, 5% and 1% respectively. k denotes the number of regressors. PSS and KS denote the Pesaran, Shin, and Smith (2001) and the Kripfganz and Schneider (2018) upper and lower critical bounds at the 1% level of significance.

Table 4C-2. Bounds test results for debt-growth model

	total debt model	external debt model	domestic debt model
F statistic	8.917***	7.350***	5.457**
k	6	6	6
PSS (2001) lower and upper critical bounds: Case 5 - Unrestricted intercept, unrestricted trend			
I(0)	3.47	3.47	3.12
I(1)	4.67	4.67	4.25
KS (2018) lower and upper critical bounds: Case 5 - Unrestricted intercept, unrestricted trend			
I(0)	4.834	4.827	3.470
I(1)	6.988	6.882	5.065

Notes: *, **, & *** denote significance at 10%, 5% and 1% respectively. k denotes the number of regressors. PSS and KS denote the Pesaran, Shin, and Smith (2001) and the Kripfganz and Schneider (2018) upper and lower critical bounds at the 1% level of significance.

Table 4C-3. SLM test for nonlinearity

	(1)	(2)	(3)
	td	exd	dd
	data interval		
lower bound	7.20	3.77	5.77
upper bound	79.68	120.83	23.044
	90% Fieller interval		
lower bound	44.26	78.89	16.97
upper bound	69.12	105.36	26. 46
	slope		
lower bound	0.004**	0.006***	0.019***
	(0.010)	(0.003)	(0.009)
upper bound	-0.002*	-0.002**	-0.002
	(0.084)	(0.019)	(0.349)
Overall test stat	1.41*	2.170**	0.39
	(0.085)	(0.019)	(0.35)
turning point	56	88	21

Note: *, ** and *** denote significance at 10%, 5% and 1% respectively; p-values in parenthesis.

CUSUM and CUSUM SQ Plots for Determinants

Figure C1-1. Total debt model 1: Plot of cumulative sum of recursive residuals

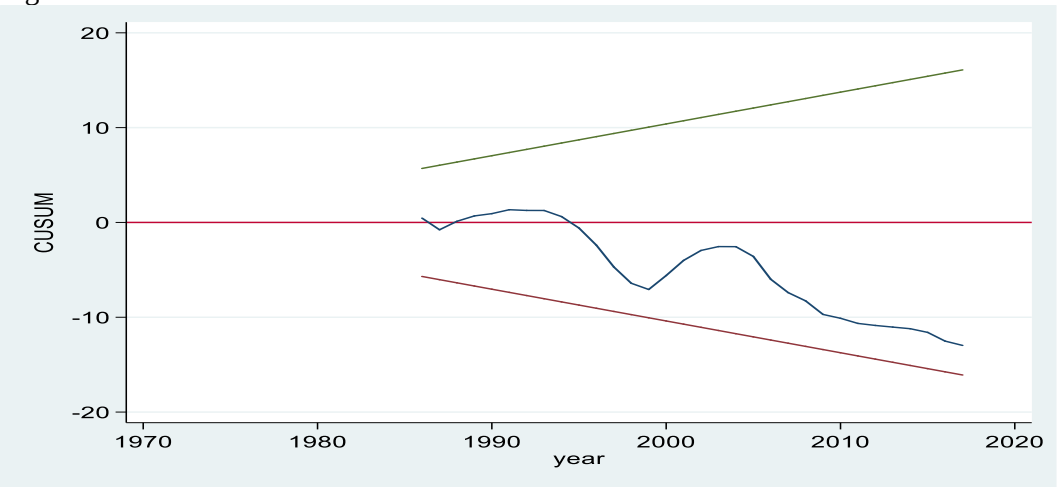


Figure C1-2. Total debt model 1: Plot of cumulative sum of squares of recursive residuals

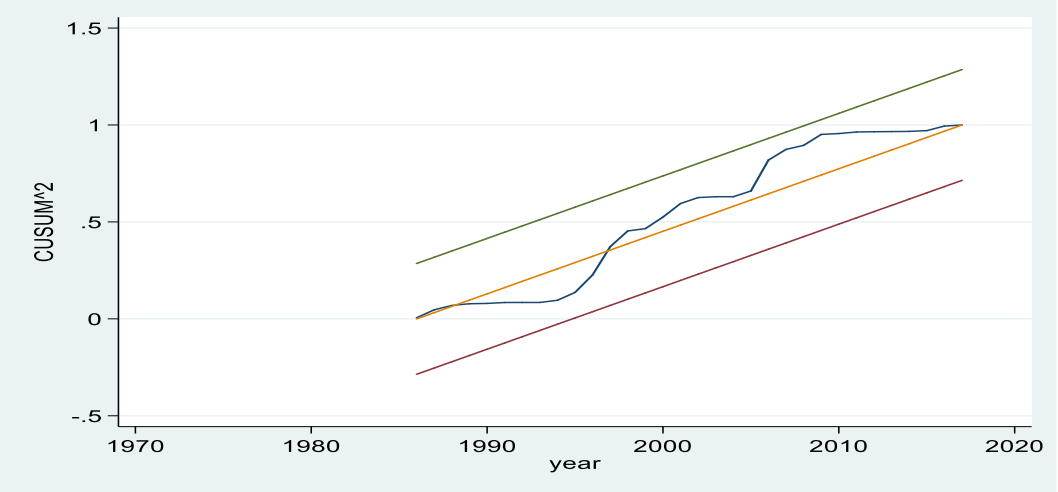


Figure C2-1. Total debt model 2: Plot of cumulative sum of recursive residuals

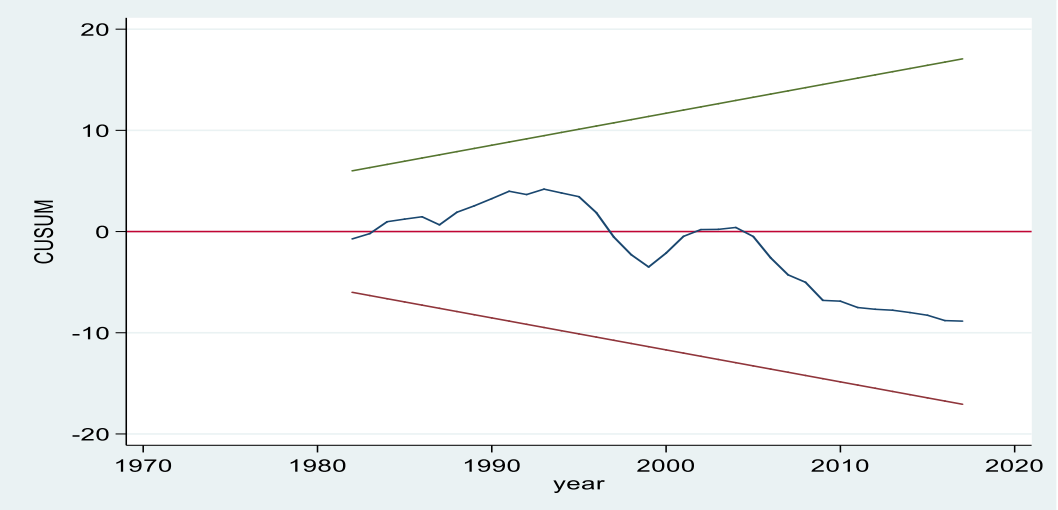


Figure C2-2. Total debt model 2. Plot of cumulative sum of squares of recursive residuals

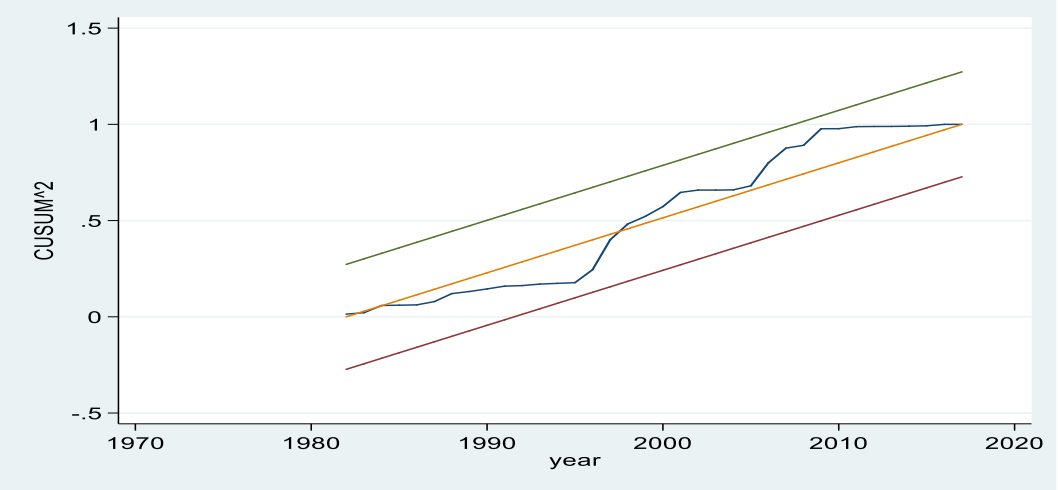


Figure C3-1. External debt model 1: Plot of cumulative sum of recursive residuals

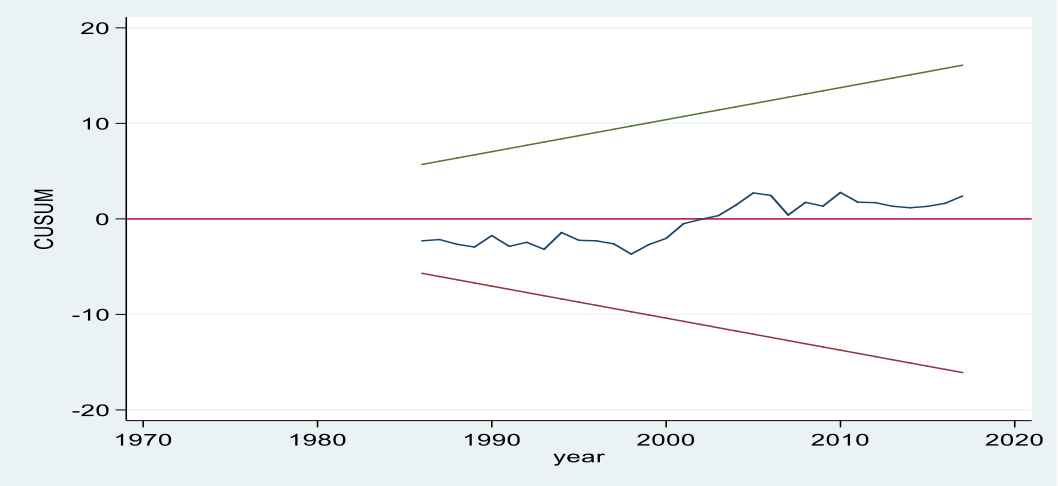


Figure C3-2. External debt model 1: Plot of cumulative sum of squares of recursive residuals

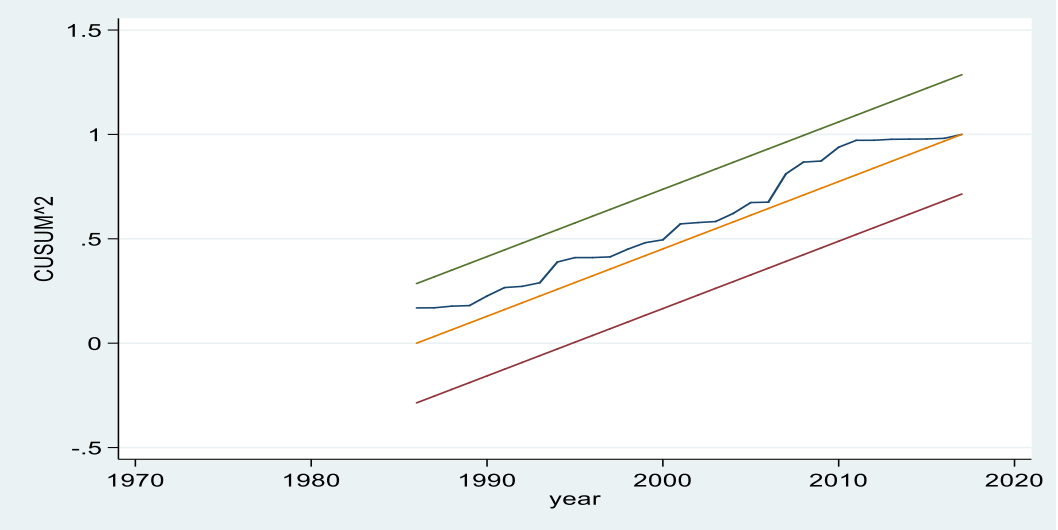


Figure C4-1. External debt model 2: Plot of cumulative sum of recursive residuals

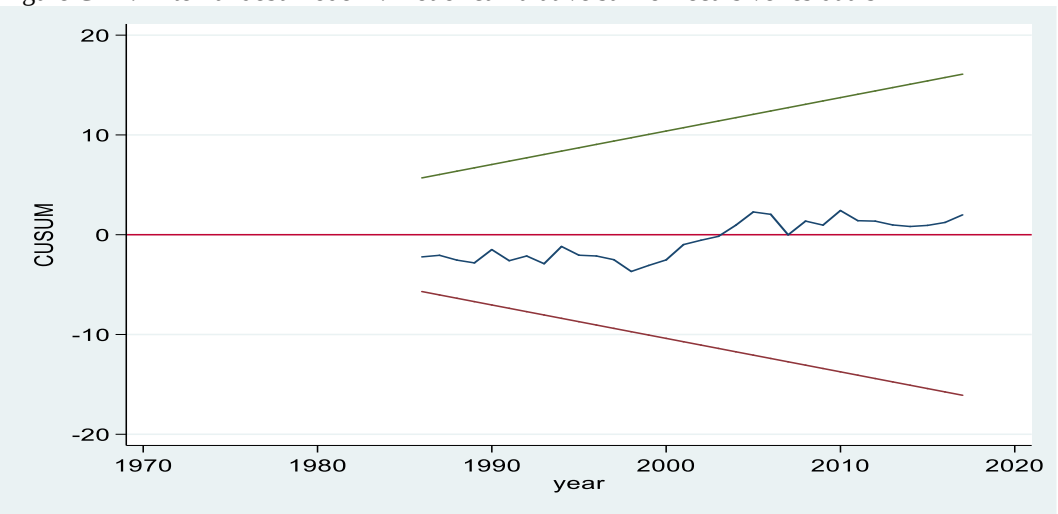


Figure C4-2. Extermal debt model 2: Plot of cumulative sum of squares of recursive residuals

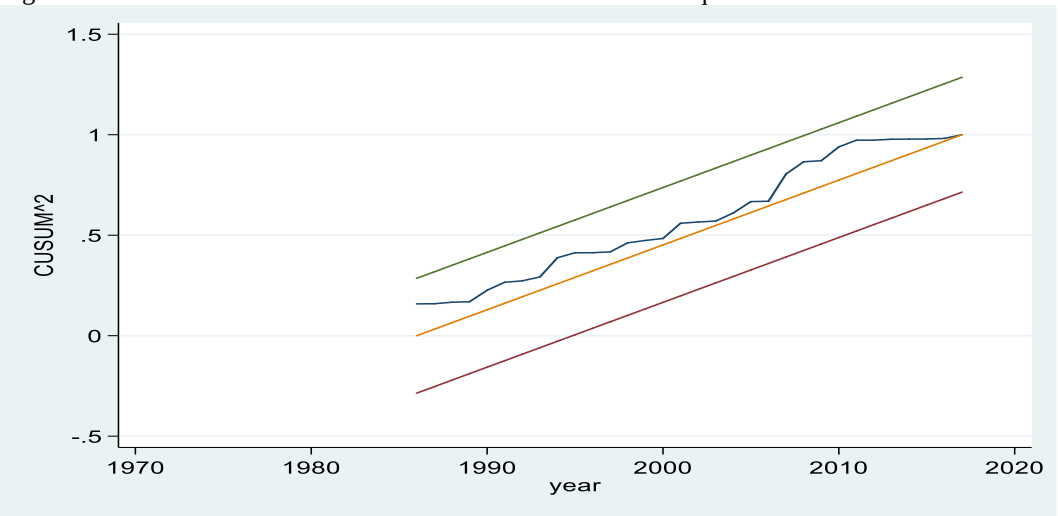


Figure C5-1. Domestic debt model 1: Plot of cumulative sum of recursive residuals

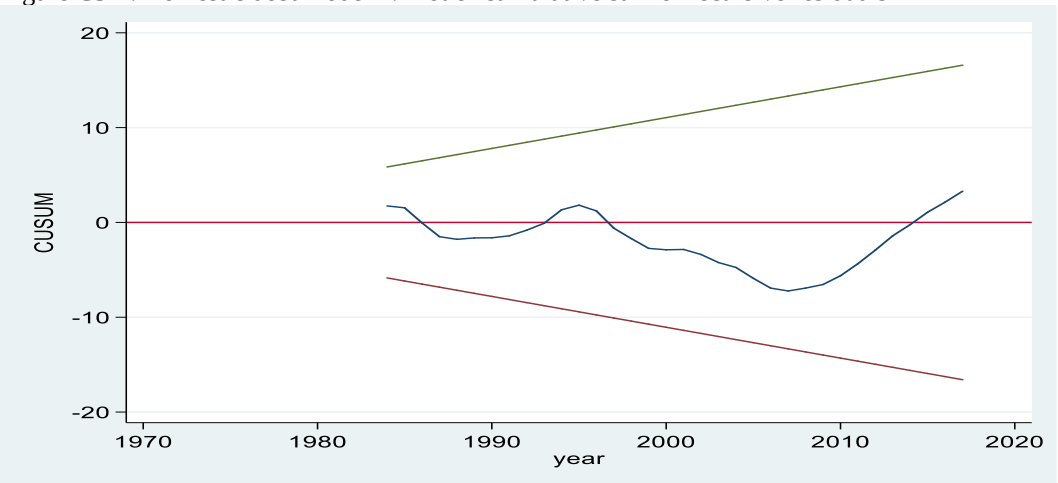


Figure C5-2. Domestic debt model 1: Plot of cumulative sum of squares of recursive residuals

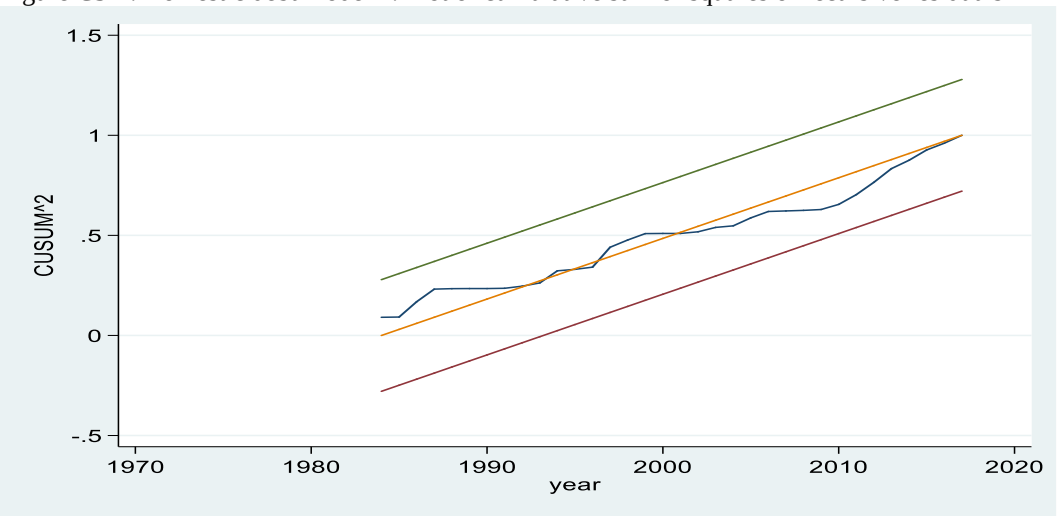


Figure C6-1. Domestic debt model 2. Plot of cumulative sum of recursive residuals

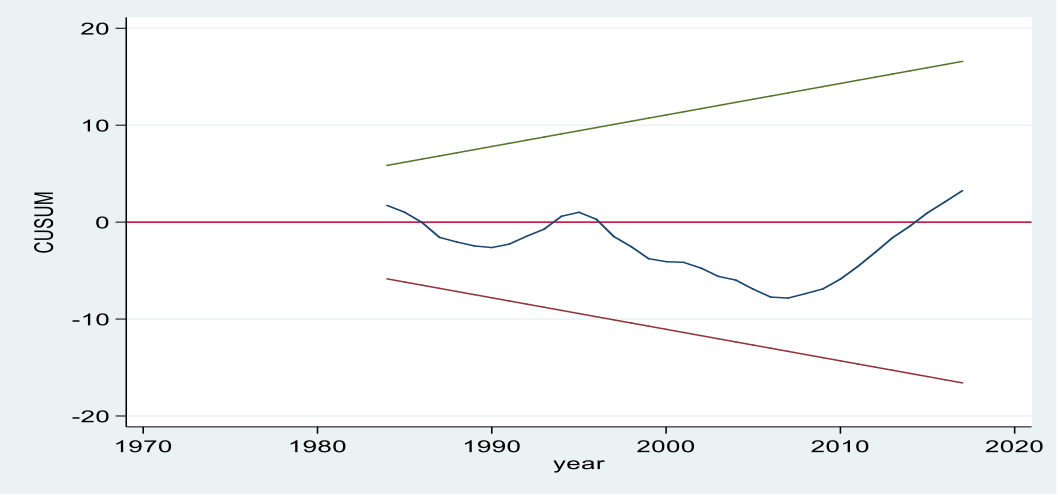
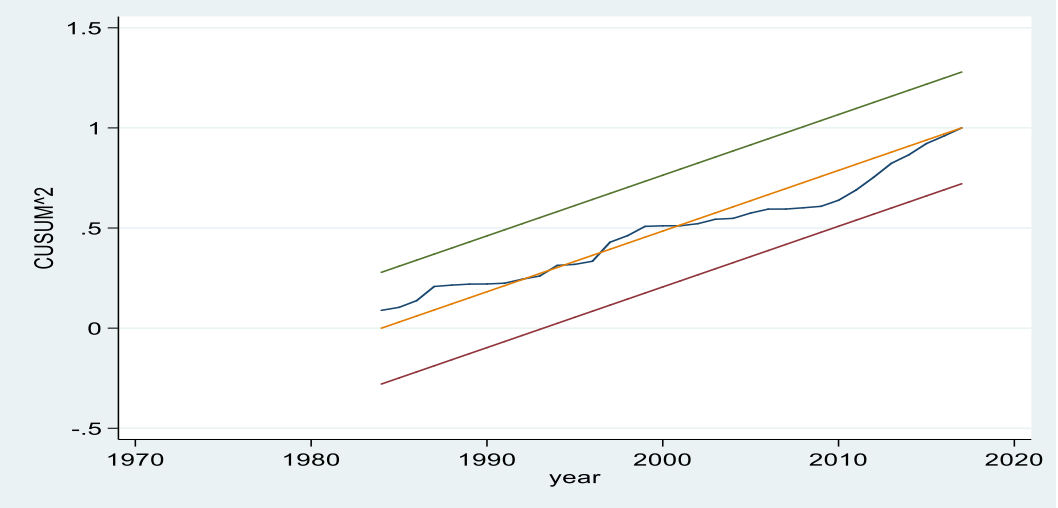


Figure C6-2. Domestic debt model 2: Plot of cumulative sum of squares of recursive residuals



CUSUM and CUSUM SQ Plots for Debt-growth model

Figure C7-1. Total debt model: Plot of cumulative sum of recursive residuals

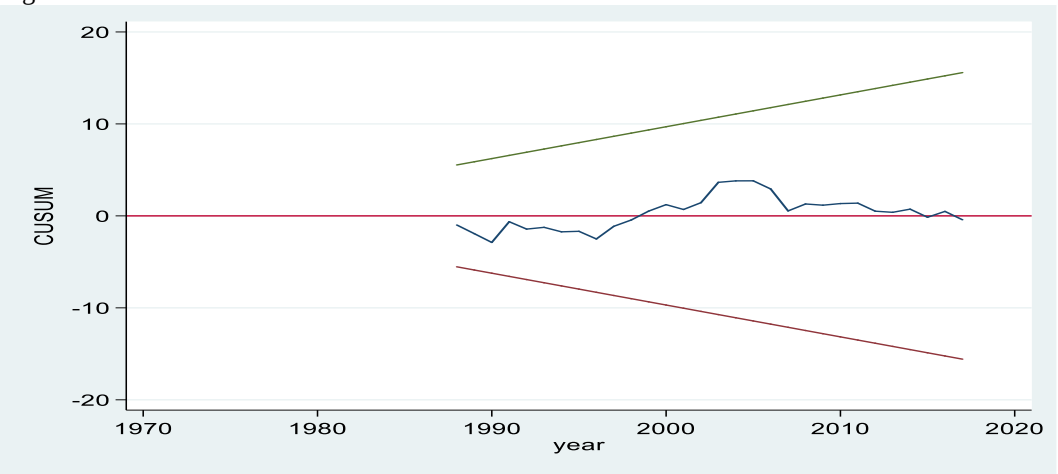


Figure C7-2. Total debt model: Plot of cumulative sum of squares of recursive residuals

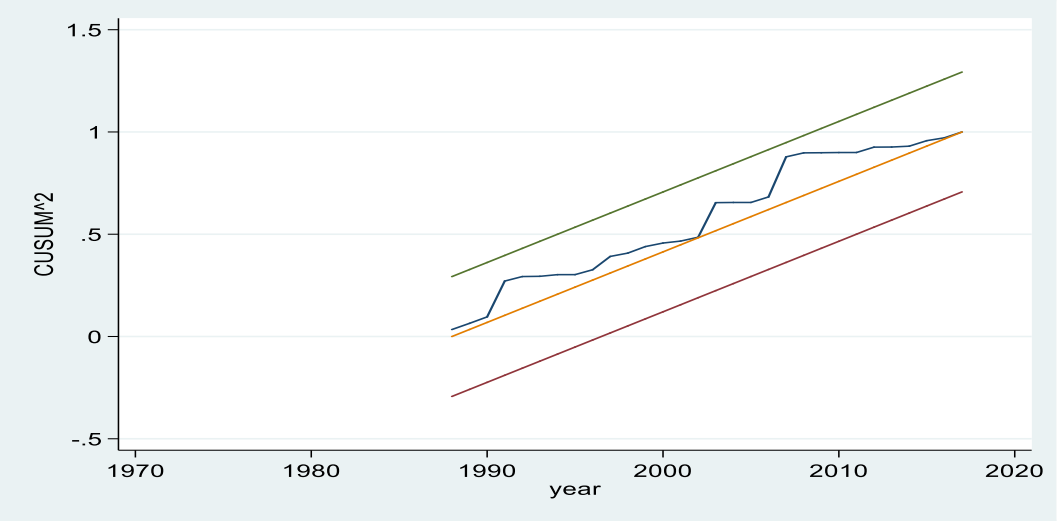


Figure C8-1. External debt model: Plot of cumulative sum of recursive residuals

Figure C8-2. External debt model: Plot of cumulative sum of squares of recursive residuals

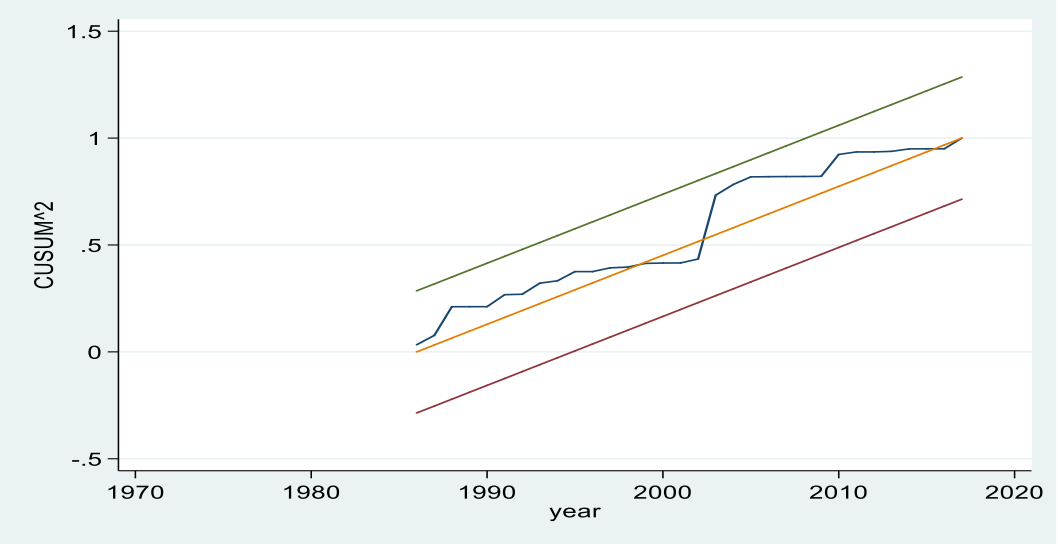


Figure C9-1. Domestic model: Plot of cumulative sum of recursive residuals

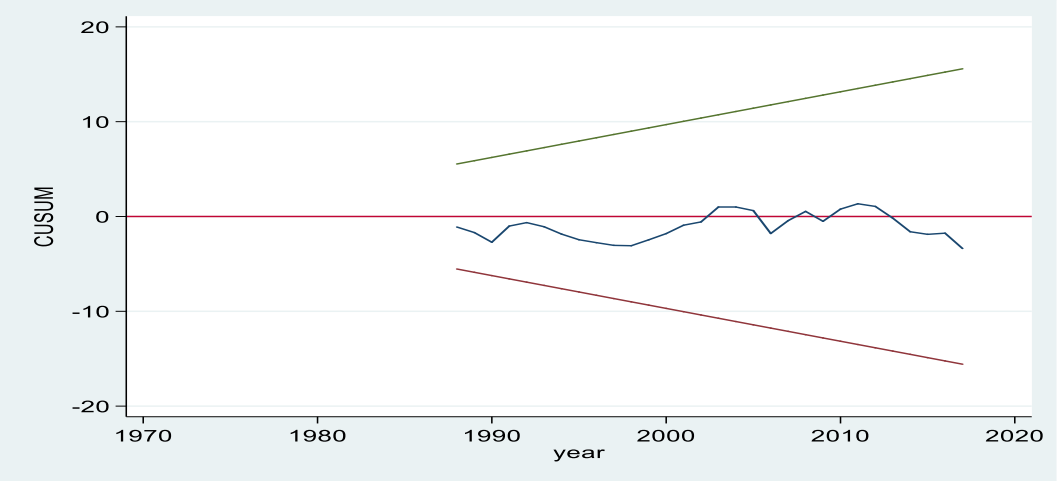


Figure C9-2. Domestic debt model: Plot of cumulative sum of squares of recursive residuals