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THE IMPACT OF PUBLIC DEBT ON ECONOMIC GROWTH IN SUB-SAHARAN AFRICA 2000-2017: A PANEL DATA ANALYSIS

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ABSTRACT

The paper examines the role of public debt on economic growth. The analysis is centered on a panel of SSA countries over 18 years period from 2000-2017. The effect of public debt components of public external debt and public domestic debt is also examined. Further, the role of government effectiveness as a measure for quality of institutions on the debt-growth correlation is explored. To achieve this, the study employs system GMM as our main estimator and the empirical results indicate an inverse relationship between public debt and economic growth in SSA region taking into account other determining factors of growth: a 1 percentage point rise in public debt/GDP ratio on average is associated with a decline in real per capita GDP growth by 0.05 percentage points. Moreover, the estimation show evidence of nonlinear relationship between government debt and growth with the effect being more negative at higher levels of public debt/GDP ratio. Good policies role on debt-growth relationship is insignificant which implies that what matters is actually how debt contracted is utilized. The main finding however is whereas public external debt has a negative effect that is statistically significant on growth in the region, the estimation indicates public domestic debt has a positive impact albeit statistically insignificant. This supposedly because domestic market enhances microeconomic stability and cushions economy from external currency shocks and that it also encourages financial market liberalization which is growth promoting. (See Akram, 2016). It is hence recommended that governments in SSA consider establishing and tapping more into domestic markets for deficit financing to reduce overreliance on

foreign loans. Measures should also be instituted to mobilize domestic resources to increase government revenues for instance by curbing tax evasions and fighting corruption. The use of Public Private Parterships (PPPs) can be an effective way of financing and also resource mobilization tool in the quest to bridge the huge gap of infrustructure development in Sub Saharan Africa.

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LIST OF ACRONYMS

AfDB	African Development Bank
ARDL	Autoregressive Distributive Lag Model
CARI	China-Africa Research Initiative
CEMAC	Central African Economic and Monetary Community
DEDH	Direct Effect of Debt Hypothesis
DRS	Debtor Reporting System
DOH	Debt Overhang Hypothesis
EM	Emerging Markets
EMDEs	Emerging Market and Developing Economies
FE	Fixed Effects
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
HIPC	Highly Indebted Poor Country
ibid	Ibidem
IMF	International Monetary Fund
LICs	Low Income Countries
LIDCs	Low Income Developing Countries
LMICs	Lower Middle Income Countries

MDGs	Millennium Development Goals
MDRI	Multilateral Debt Relief Initiative
OLS	Ordinary Least Squares
SOEs	State-Owned Enterprises
SSA	Sub Saharan Africa
UMIC	Upper Middle Income Country
WB	World Bank
WDI	World Development Indicators
WGI	Worldwide Governance Indicators
WEO	World Economic Outlook

CHAPTER ONE: INTRODUCTION

Public debt comprises the debt related liabilities including public domestic and public external debt of the public sector. World Bank, (2019). According to World Bank's WDI external debt are "obligations of public debtors including the national government, public corporations, state owned enterprises, development banks and other mixed enterprises, political subdivisions, autonomous public bodies and external obligations of private debtors that are guaranteed for repayment by a public entity". On the other hand, Abbas (2007) defined public domestic debt as "all domestically held claims of the central government comprising banks claims on government and central bank securities".

Public debt build up has been experienced across all income groups but rose much strongly in SSA region lately. This rapid surge in government debt/GDP ratios has elicited concerns on public debt serviceability in developing countries especially SSA, including many that benefited from large-scale HIPC and MDRI debt relief. The region's ability to sustain economic growth amid ballooning public debt/GDP ratios is also a source of concern. The World Bank has also projected that by the year 2025 debt levels will be 80% of GDP on average in the region pre-debt relief levels.

The effect of soaring debt/GDP ratios in the SSA and role of governance on debt-growth relationship is unexplained in the region. Debt-Growth nexus give mixed findings with scholars using different analysis techniques. Sub-Saharan Africa countries like other developing countries largely depend heavily on public debt (borrowing or aid) for financing their expenditures. Public debt has been crucial in developmental projects,

input expansion and budgetary support in SSA. Public debt to GDP ratios have been increasing and though has the potential to promote growth, lack of prudent debt management framework may render it harmful to growth. "External indebtedness affects a country's creditworthiness and investor perceptions and total debt service is contrasted with countries' ability to obtain foreign exchange through exports of goods, services, primary income, and workers' remittances". (World Bank WDI)

Kumar and Woo, 2010 observes that huge sums of the sovereign obligations is probable to have harmful effects on accumulation capital and productivity consequently reducing country's growth. Kumar &Woo, (2010). This is because countries may result to higher future distortionary taxation to amortize debts, there will be higher taxation rates, higher long-term interest rates hence more vulnerability and uncertainty to crises. (*ibid*).

In spite of the foregoing there is little empirical proof on the degree to which public debt in SSA affects growth. Many researches on public debt and economic growth nexus have been carried out largely in advanced economies such as Balazs Egert, (2014) and Kumar, (2010). Studies focusing on debt and growth relationship in LDCs such as by Pattillo, Poirson, and Ricci (2002) and recently Senadza, B. et al, (2017) only pay attention to countries' total external debt not even public foreign debt.

To this end therefore, some basic public debt policy questions beg such as: Is there correlation between government debt and growth? Is the correlation linear or nonlinear? Is the influence of public external debt any dissimilar from public internal debt on growth and does government effectiveness have a role on debt-growth relationship?

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To answer such questions this study employs empirical analysis using system GMM estimation methodology owing to its capacity to address biases in a panel data for Sub Saharan Africa countries for the period 2000-2017 using secondary data extracted from International Monetary Fund's WEO Database, World Bank's WDI and Worldwide Governance Indicators (WGI) databases that are accessible online.

The research questions, objectives and our hypothesis are summarized as follows:-

Research Questions

These questions will be addressed by our research:-

i)   Does the rapid rise in public debt affect growth in SSA?

ii)   Is the correlation between public debt and growth in SSA nonlinear?

iii)   Does government effectiveness have a role on government debt and growth relationship in SSA?

Objectives of the Study

This study investigates whether there is any direct effect of sovereign debt and economic growth in SSA. The research further seeks to explore whether some level of public debt promotes growth. The study further explores effect of the categories of public debt on growth in SSA and whether government effectiveness affects debt and growth relationship in SSA. Factors that have significant causal effects with economic growth based on theory will also be controlled for the study.

The main objectives of the study are to:-

1. Explore the effect of public debt on economic growth in SSA.

2. Examine whether the relationship between public debt and economic growth is nonlinear for SSA.

3. Probe further, whether government effectiveness affects government debt-growth relationship in sub-Saharan Africa.

Hypothesis

Hypothesis will be tested for two main objectives. The first and third objective specified above form major objectives of the study hence, the two hypothesis are specified as follows:

i) **H0**: Public Debt does not affect growth in SSA

   Ha: Public Debt does affect growth in SSA and,

ii) **H0**: Government effectiveness doesn't have a role on the relationship between public debt and growth in SSA

   Ha: Government effectiveness has a role on the relationship between debt and growth in SSA.

Organization of the Research

This paper is grouped into 6 chapters. Chapter two discusses theoretical and empirical literature review on the correlation between government debt, public foreign debt, public internal debt and economic growth. Chapter three highlights the overview of public debt in SSA while research methodology (Data and stylized facts and econometric methods) are outlined under chapter four while estimation of results is in chapter five. Lastly, the conclusion and policy recommendations is on chapter six.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Concerns have been raised by economic analysts and stakeholders over the ballooning public debt/GDP ratio and the inability of developing countries and, for that matter, SSA countries to effectively administer their debt management policies, leading to continuous debt sustainability concerns and debates. The huge debt accumulation has invited theories and empirical studies into assessing the role of public debt on economic growth. This chapter discusses existing theories and empirical studies on role of government debt, the role of both public domestic and external debt as well as studies on the role of total external debt and growth. It also offers a digression on the role of government effectiveness in the relationship between public debt and growth.

2.2 Theoretical Literature

2.2.1 Debt Overhang Hypothesis (DOH)

Krugman (1988) noted that there is a probability that future indebtedness will outgrow the nations' redemption capability; anticipated servicing of loans will deter any more internal and external investments as the income from the profitable investment plans will be dismal to boost the sectors since remarkable part of any resulting economic growth will increase to the lending country.   The internal and external investments will be reduced further thereby reducing the growth of the economy (Krugman, 1988; Sachs,

1989). According to (Claessens el al., 1996) in a debt overhang scenario investors anticipate devaluation and inflation among other distorted economic actions as a way of debt servicing. Negotiating debt rescheduling also discourages investment as it raises doubts about the suitability of business environment.

2.2.2. Crowding Out Theory

The replacement of individual financial endeavor by national financial operation endeavor is crowding out (Buiter, 1990). Crowding out reduces the individual consumption because of the increase in state spending. The rise in state spending financed by taxation decreases individual consumption. In case taxes are not increased by the state, the state turns to borrowing which entails interest rate increases and a reduction in individual investment. It is argued that increased state borrowing from the financing industry has a remarkable impact on individual borrowing and crowds out individual borrowing. Another expectation is that entry to secure state investment deters financial institutions from giving loans to high risk private sector. When the financial institutions are inhabited by lazy banks, a dollar borrowed by the government may give rise to greater than a dollar in crowding out of individual financing (Emran & Farazi, 2009). State expenditures are in most cases more than the revenues generated from taxes especially in states which are developing. As a result of low and developing financial markets, the state turns to external borrowing to finance the deficit in the budget. Although external debts hardly alter internal rates of interest and issue of loanable

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finances, there is a possibility of the effects on the cost crowding out on private capital (Beaugrand, Loko, & Mlachila, 2012). Gray & Woo (2010) argue that in case a deficit in the budget originated from the expenses on domestically produced items, external debt give rise to actual foreign rate of exchange which bring about the crowding out influence of exporters and some domestic producers. Similarly even though the cost of interest on external debt is small when compared to internal debt, there can be crowding out of individual credit because of relatively huge amount to be serviced.

Likewise, if a bigger portion of foreign money or locally mobilized resources is used in debt servicing of the foreign debt, then meagre resources are availed to fund investment and consequently growth, the channel is also known as the 'crowding out' effect. The burden of servicing the debt on the government reduces public spending and social investment spending such as education and health, which are essential for growth through human capital development channel. Access to good education and health systems is essential for the production of high quality human resource.

Therefore, government failure to invest in health and education reduces human capital, productivity decelerates and hence a decline in economic growth. Serieux and Samy (2001) noted slower growth in physical capital can indirectly affect growth by reducing the productivity of new investments. The heavy debt burden means that short-term government revenues are used for debt servicing and thus prevent public investment in some sectors of the economy, which are essential for economic growth. As a result, investments in the local economy could be heavily influenced. (*ibid*). A decrease in

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public investment may lead to a reduction in private investment, because certain private investments supplement public investment (Diaz-Alejandro, 1981, Taylor, 1983). Poor infrastructure structures resulting from crowding out effect can lead to a reduction in the productivity of the investment.

2.2.3. Debt Laffer Curve Theory

Recently, the Debt Laffer Curve has gained much focus and is based on the premise that there is threshold levels of external debt where it has positive effect on growth beyond which further debt contraction hampers or inhibits growth. For instance, 38.4% debt/GDP ratio Smyth and Hsing, (1995), 160% debt/exports by Pattillo, Poirson, and Ricci (2002).

2.3 Empirical Literature

Studies on the role of debt on and economic growth (largely total external debt) mainly sprung up after the start of the debt distress in early 1980's. A lot of studies on debt focus on either group of countries or specific countries and majorly focus on external debt owing to unavailability of domestic dataset. This subsection looks at studies that have focused on public debt, both public foreign debt and internal debt and also total foreign debt in relation to growth.

2.3.1. Studies on Role of Public Debt

Kumar & Woo, (2010) explored the effect of high indebtedness on long-term growth of 38 advanced and emerging markets. The researchers employed the OLS, fixed effects and system GMM dynamic panel estimation models. The empirical results revealed a negative association between initial-debt and preceding per capita GDP growth. They found growth is inhibited by 0.02 percentage points on average following one percent point rise in initial public debt/GDP share. They also found evidence of nonlinearity with increasing initial debt levels having relatively greater negative impact on preceding growth. (Kumar & Woo, 2010). The study did not focus on countries from SSA region.

Balazs Egert, (2014) tested if sovereign debt has an inverse nonlinear influence on economic growth if Public Debt surpasses 90 percent of GDP on a group of 20 Advanced, 16 Emerging Markets Economies and 5 Developing countries for the year 1946-2009. Using nonlinear threshold models, he establishes in very rare cases that the inverse

nonlinear relationship sets in at public debt in the range of 20 percent and 60 percent of GDP. (Balazs Egert, 2014)

Kourtellos et al (2012) used a 10-year balanced data set of 82 countries for the years 1980-1989, 1990-1999 and 2000-2009. The real growth rate of GDP per capita was used as a measure of growth. Structural threshold regression method was used to study the independent effects of government debt on growth using debt as a measurement variable and many other possible variables. They found clear evidence of the effects of a democracy-based threshold, which shows that high debt inhibits growth in economies characterized with a weak democracy system and that, if public bodies are of high quality, then debt has insignificant effect on growth. (Kourtellos, Stengos, & Tan, 2012)

2.3.2. Studies on Role of Public External and Domestic Debt

Naeem Akram, (2017) probed impact of government debt on growth and capital formation in Sri Lanka, for 39 years ranging from 1975-2014 by using the ARDL method. The study revealed that in Sri Lanka, public foreign debt aided the course of economic growth with debt service having an inverse relationship with growth and capital accumulation. Internal debt was found to be growth enhancing.

Naeem Akram, (2016) also sought to analyze the consequence of public debt for economic growth and poverty on selected 4 Asia countries[1] during 1975-2010 period.

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[1] Pakistan, India, Bangladesh and Sri Lanka

By using dynamic panel data estimations of OLS, FE, and GMM the result showed that internal debt has a positive correlation with growth and inversely correlated with GINI coefficient showing it's pro-poor while public foreign debt has a harmful effect on growth and insignificant relationship with income inequality. (Akram Naeem, 2016)

2.3.3. Studies on the Role of External Debt

Schclarek (2004) established that there's no proof that foreign debt negatively affect total productivity after evaluating its impact on growth utilizing data for 24 industrialized and 59 developing economies on 32 year-period spanning from 1970 to 2002. He noted that high economic growth is realized with lower level of only public foreign debt and not private foreign debt in developing countries while in industrialized nations the harmful relationship between public foreign debt and growth never holds.

Senadza et al. (2017) conducted a study of total foreign debt and economic growth relationship on 39 SSA countries for 1990-2013 period. Employing an estimation methodology of system GMM, they found that a 1 percentage surge in debt-to-GDP ratio negatively affects growth by 0.05 percent points and also established that the nonlinearity association is nonexistent. They established the middle income dummy to be insignificant, which implies that being a rich or poor country in SSA region does not change the narrative that foreign debt hinders development. The study focused on foreign debt stocks unlike public external debt and didn't explore institutional quality role on debt-growth relationship.

Cordella et al (2005) explored debt effect on economic growth in seventy nine developing country economies. The writers' main question was if HIPC suffered from debt and also tried to measure effect of policies applied in the countries. The estimators of the OLS and system GMM were employed. GMM estimation model was chosen owing to its capacity to control for unobservable country and time specific effects, and reducing the possible biases while simultaneously controlling for the possible endogeneity inherent in certain explanatory variables. They found that in countries whose policies and institutions are better debt over-hang effect is experienced when debt surpasses 15% to 30% of GDP, then if debt is 70 % to 80% of GDP they suffer negative marginal effect and beyond that level, the marginal impact of debt on economic growth comes to zero. (*ibid*). Nations having the most unfavorable policies and institutions have alike thresholds, although at smaller levels. However, they found statistically insignificant correlation between debt and economic growth in heavily indebted poor countries.

Fosu (1999) applied OLS estimation technique to analyze the influence of foreign loans on growth on SSA during the debt distress 1980 to 1990 period on an augmented production function. His main focus was to test the direct effect of debt hypothesis (DEDH) using average data on 35 SSA countries. He used net debt calculated as total foreign debt stock less total reserves expressed as a share of GNP, as an indicator of debt burden and found that foreign debt negatively affects growth even with no or little impact on investment.

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Cohen (1993) also employed OLS technique to estimate investment equations for 81 developing countries for grouped periods of 1965 to 1973, 1974 to 1981 and 1982 to 1987. He found that the level of foreign debt does not provide explanation on the declining capital formation levels and for that matter the growth of GNP in those countries.

From the literature review we can observe that no studies are available on the correlation between sovereign debt and growth in SSA. The present study intends to fill the gap by investigating role of sovereign debt on growth in the region.

2.4. Digression on Role of Government Effectiveness

Governance specifically government effectiveness which in this paper is viewed as a measure of "quality of policy formulation and implementation and the credibility of the government's commitment to such policies" as defined by World Bank in WDI, can be viewed not only as a driver of debt mobilization but also how the contracted debt is utilized for economic growth. A country can raise its economy by borrowing money if it is used efficiently and on average, while overused and irresponsible, its impact will deteriorate. Institutional aspects can affect the role of debt on growth in different ways. (Butkus & Seputiene, 2018). According to (Cooray et al. 2017; Benfratello et al. 2018; Njangang 2018), extensive research shows that the governments of the most fraudulent regimes borrow more, because the rise in corruption is linked to the surge in sovereign debt. According to Joao T. Jales, (2011) on the analysis of governance qualities i.e.

control of corruption and democracy levels influence on the relationship between total foreign debts on growth on 72 developing countries from 1970-2005, he observed that countries with lesser corruption levels appear to utilize their debt well. He concludes that the quality of institutions define debt levels and how contracted loans will be distributed. (*ibid*). Also Shleifer and Vishny (1993) contend that fraudulent regimes channel contracted funding from useful growth promoting sectors like education and health to defense and infrastructures with less value addition because have opportunities for corruption. A relatively high risk premium is also paid when issuing bonds in countries where there is corruption or political instability according to (Ciocchini et al. 2003 and Baldacci et al. 2008). The countries also prefer bilateral expensive sources whose loans are non-concessional.

In conclusion, weak institutions tend to reorient themselves to low productivity areas by using overly borrowed and irresponsible credit resources. The poor quality of public sector management can lead to higher loan costs and vice versa. We do not know of any empirical survey among SSA countries to confirm role of governance on the debt growth relationship.

CHAPTER THREE: PUBLIC DEBT IN SSA

3.1. Introduction

This chapter outlines overview of debt profile of Sub-Saharan Africa specifically trends and stylized facts on debt accumulation, dynamics and discusses share of public foreign debt and internal debt in the total government debt.

3.2. Overview of Public Debt in Sub Saharan Africa

According to World Bank, (2018) structure of sovereign debt has transformed from conventional concessional sources of funding to more commercial-based and internal debt. The proportion of concessional and multilateral loans tends to decrease and in 2016 most bilateral loans were delivered by non-Paris Club lenders, such as China. Commercial-based foreign debt has become a new spring of funding for many not only quite a lot of LMICs but also for LICs. Though sovereign bond issuance allows governments to expand their pool of investors and supplement their funding from multilateral and bilateral sources, a huge ("bullet") servicing payments from 2021 represents a substantial refinancing challenge in SSA. (World Bank Group, 2018).

Most of the empirical studies largely pay attention to external debt owing to lack of a domestic public debt database that provides readily available and reliable cross country comparable data and also the fact that external debt is so prominent to domestic debt. There is no mandatory reporting with the Bretton woods institutions for the domestic

debt unlike external debt. Nonetheless, according to World Bank, 2018 domestic debt markets in LICs and UMICs has developed greatly post debt crisis period (after 2000s)

Advantages of Domestic Debt

- According to Hausmann et al., 2006; Bacchiocchi and Missale, 2012, public debt portfolio has less exposure to exchange-rate risk if and when is denominated in local currency.

- There's a less likelihood of capital outflows from the economy (Calvo, 2005)

- According to Mehrotra et al., (2012), with domestic debt it is possible to carry out counter-cyclical monetary policy to alleviate the consequences of shocks from external environment.

- Another benefit is that domestic markets contributes to enhanced institutional infrastructure which underlies the organization and functioning of domestic financial markets. Arnone and Presbitero, (2010).

- Fry (1997) in analyses of more than 66 LICs and EMs found that commercial-based internal debt issuance tends to be less costly method of funding the budgetary gaps as opposed to foreign debt stifles growth, shrinks local savings and causes inflation.

Long-term internal debt minimizes maturity and currency mismatches inherent with external debt and hence tends to be safer. However, analysts have caveats and stresses the benefits are realized in the presence some conditionality such as of comprehensive institutional and macroeconomic framework and if domestic debt portfolio has the

following characteristics.

1. Long-term government securities at a sensible cost to avoid vulnerability to rollover and risks on interest rate

2. A diversified investor base to reduce public debt costs and market volatility. Bias towards commercial banks as lenders may deteriorate crowding out effects and thereby reducing banking system's efficacy. Abbas & Christensen, (2010), Arnone & Presbitero, (2010), Hausmann et al., (2006) Panizza, (2008) and Presbitero, (2012b).

Despite these benefits, effects of internal debt on economic growth in SSA remain elusive with few studies done on internal debt markets as unlike foreign debt.

According to (Todaro P & Smith S, 2012) during early stages of development, countries have to acquire debt because of insufficient local savings for investment. The Harrod-Domar growth model has traditionally inspired growth experts to explain the importance of public debt in bridging the savings-investment gap in low income and emerging economies. Financing development programs and projects in these countries is a key challenge in an effort towards realizing the major goal of sustainable development.

External debt may promote economic growth when contracted resources are devoted in the right growth channels particularly the productivity growth channels and not merely input expansion only. Sulaiman and Azeez (2012) asserts that external debt build up doesn't imply slow growth in their analysis for Nigeria whereas Were (2001) argued that it is the lack of knowhow about the nature of the debt, its structure, and the magnitude

of the debt coupled with inability to meet the debt obligation that impedes growth. These arguments imply that government borrowing is not intrinsically detrimental to economic growth.

In this regard therefore, the increase in debt burden is generally not the problem if it is used to fund investments that raise a nation's output potential, and as a result its capability to amortize loans contracted. (World Bank, 2017). In some low-income countries, increasing deficits can be directly linked to the demand to fund government investment, as the median government investment as a percentage of GDP doubled to 6% in 2015 from 3% in 2000. This was experienced by Mali, Guinea-Bissau, Madagascar and Nepal, in which broader fiscal shortfalls match high investment in public sector. (IMF, 2018a). However, the countries are a minority as much lending to low income countries has been used to finance increased recurrent expenditure. In resource-rich countries in SSA, for example, most of the increase in expenditure facilitated by an increase in primary commodities' prices was directed to salaries in the public sector according to (World Bank, 2018a). According to the same report, some loans may have been diverted to consolidate private assets stored abroad. (*ibid*). According to (Reinhart and Rogoff 2010; Reinhart et al. 2012) high indebtedness also generates uncertainty, prevents new venture startups and innovation, and thus has a harmful effect on economic growth. The present paper is focused on investigating the direct role of government debt and its decomposition i.e. public internal and public external debt on economic growth in SSA countries as well as the role of governance on the correlation between public debt and growth.

3.3. Stylized Facts on Debt Accumulation in SSA

This section examines the evolution and dynamics in composition of public debt levels in recent years relying on information from International Monetary Fund WEO Database on Gross Government Debt/GDP ratio. The coverage of public debt varies markedly across countries with respect to institutional coverage of the public sector i.e. central government, state/local governments, extra budgetary operations, state-owned enterprises and the inclusion of government guarantees with coverage typically being narrow in most LIDCs. IMF, (2018)

3.3.1. Evolution of Debt in LIDCs

In the past 5 years, public debt has risen substantially across a range of LIDCs[2] having fallen steadily for many years. IMF, (2018). From 2000 to 2013, the median sovereign debt as a proportion of GDP for this category of countries decreased from a high of 94% of GDP in the year 2001 to 33% during 2010-2013. From the end of 2013 to 2017, the median government debt-to-GDP ratio increased by 13.5 percentage points in LIDCs to reach 47% of GDP. The debt-to-GDP ratio increased by at least 10 percentage points in 29 countries, increased by less than 10 percentage points in 19 countries and declined/remained unchanged in 8 countries among the group. (*ibid*)

Across regions, LIDCs in Sub-Saharan Africa have recorded the fastest rise in public

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[2] The LIDC grouping was based on a 2011 GNI per capita of $2,390

debt levels. The median debt levels rose remarkably from already elevated levels in the Middle East/Central Asia region while increased more modestly among Asia/Pacific LIDCs and remain substantially lower than other regions. Debt has remained broadly unchanged at elevated levels in the handful of LIDCs in other regions. (*ibid*)

Figure 1: Median Public Debt Accumulation in Different Groups
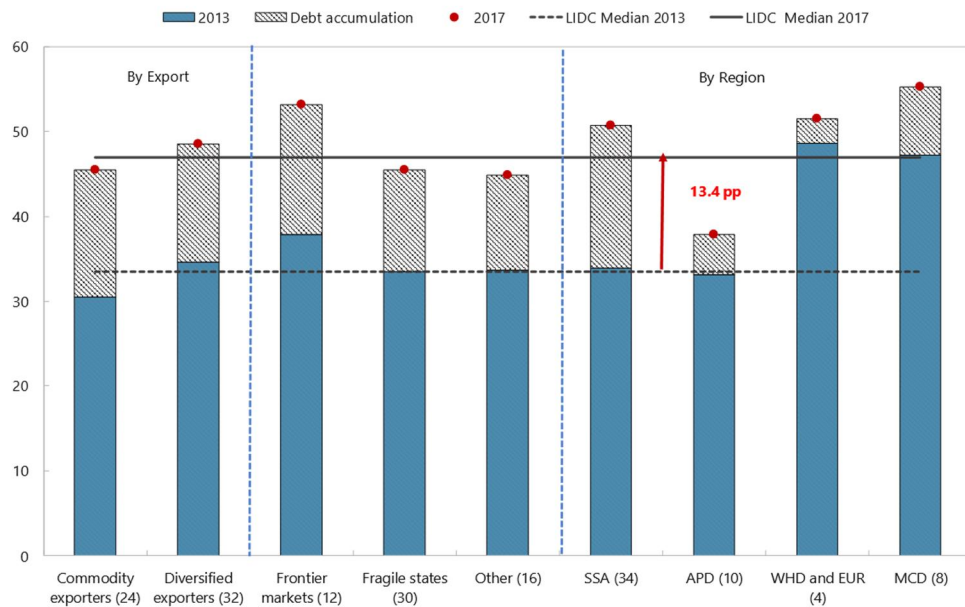
Source: World Bank's Africa's Pulse Report, 2018; WEO and IMF staff calculations. Note: Eritrea, Somalia and Timor-Leste were excluded due to data limitation. Cote d'Ivoire and Papua New Guinea are both Frontier and Fragile

Increase in debt has been across all groups but slightly larger among commodity exporters as in shown in figure 1. Among the 24 commodity exporters, debt rose by a

median 15% of GDP, as opposed to 13¾ percent in diversified exporters; the 2014 commodity price shock and its impact on domestic fiscal positions contributed to this difference. Debt levels increased by similar magnitudes in frontier markets and fragile states, with somewhat smaller debt accumulation in other countries. (*ibid*).

Public debt build up among Emerging Market economies in Asia has remained relatively stable slightly above 40 percent of GDP from 2011 to 2017 while in Advanced Economies a surge in average public debt to GDP ratio from 50% share of GDP in 2008 was experienced to about 70 percent in 2017. See figure 2 below.

Figure 2: Trends in Public Debt in SSA, EMA and Advanced Economies
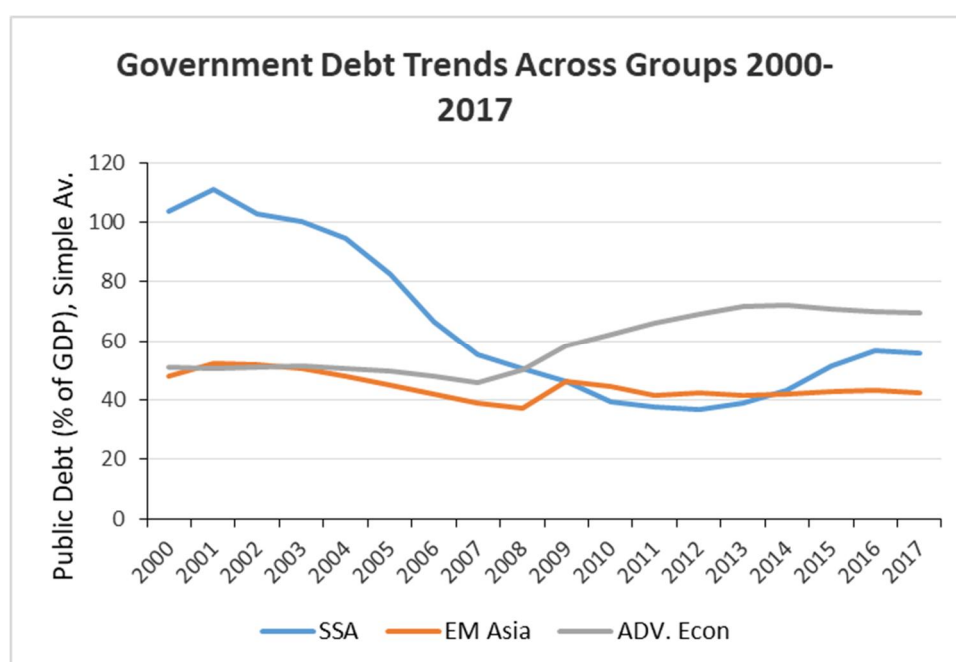
Source: Author's Computation using IMF World Economic Outlook Database, 2019

The simple average level of public debt in sub-Saharan Africa tended to decline till 2012.

Through the late 1990s and 2000s, 30 LDCs from Africa benefited from a nominal debt forgiveness of more than 100 billion dollars thanks to HIPC and MDRI initiatives. As a result, average levels of public debt in sub-Saharan Africa had declined by 2012.

From figure 3 below, between 2012 and 2017, the region's sovereign debt rose from an average of 37% to 56% of GDP; about 20 percentage points. More than two-thirds of SSA countries saw government debt/GDP ratios increase by over 10 percentage points, whereas a third of states saw more than 20 percentage point increase during the same period. World Bank Group (2018)

Figure 3: Sub Saharan Africa Public Debt Trends 2000-2017
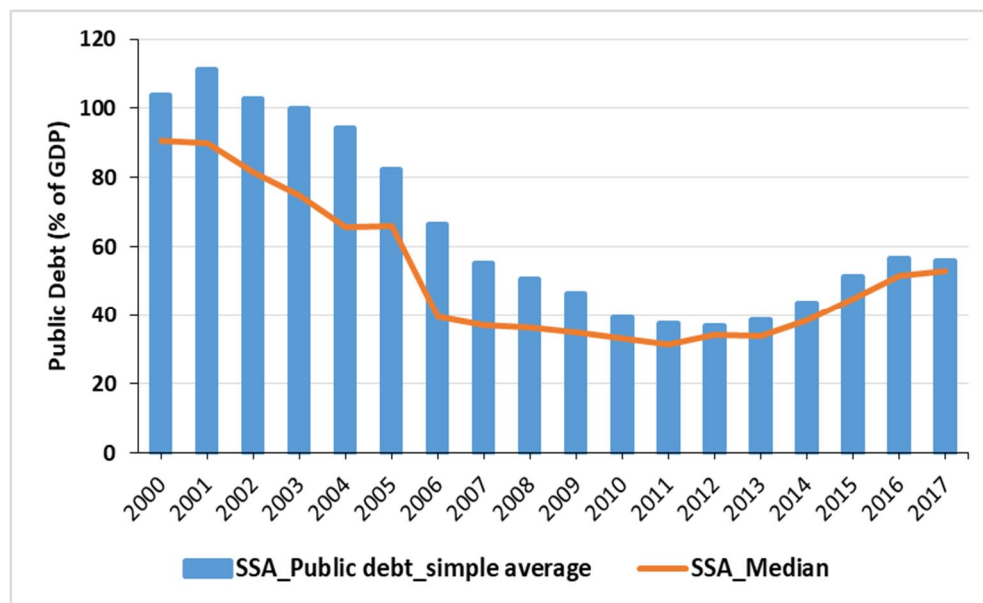
Source: Author's Computation using IMF, World Economic Outlook Database, April 2018

The analysis centers on 45 SSA countries that report debt with DRS and for each public debt refers to general government gross debt which are liabilities by state, local government and municipalities to GDP ratio.

3.3.2. Dynamics of Public Debt in SSA

Public debt rose in all income groups in sub-Saharan Africa, but more pronounced among LMICs countries. (On average by 22 percentage points). In the middle of 2012 and 2017, the median sovereign debt rose from 34% to 53% of GDP. LMICs witnessed a slight drop in average while median debt-to-GDP levels has been rising from 2007-2017 as countries tapped into international capital markets. By 2017, average public debt reached 56 percent of GDP and the median was 53%, 19 percentage points greater than the 2012 level. The pattern of public debt build up was the same for low-income countries, with median government debt increasing by 23 percentage points to reach 52% of GDP in 2017. The median government debt level in upper middle income countries rose by 29 percentage points during the same period due to the expansion of domestic debt markets.

Figure 4: Public Debt by Income groups
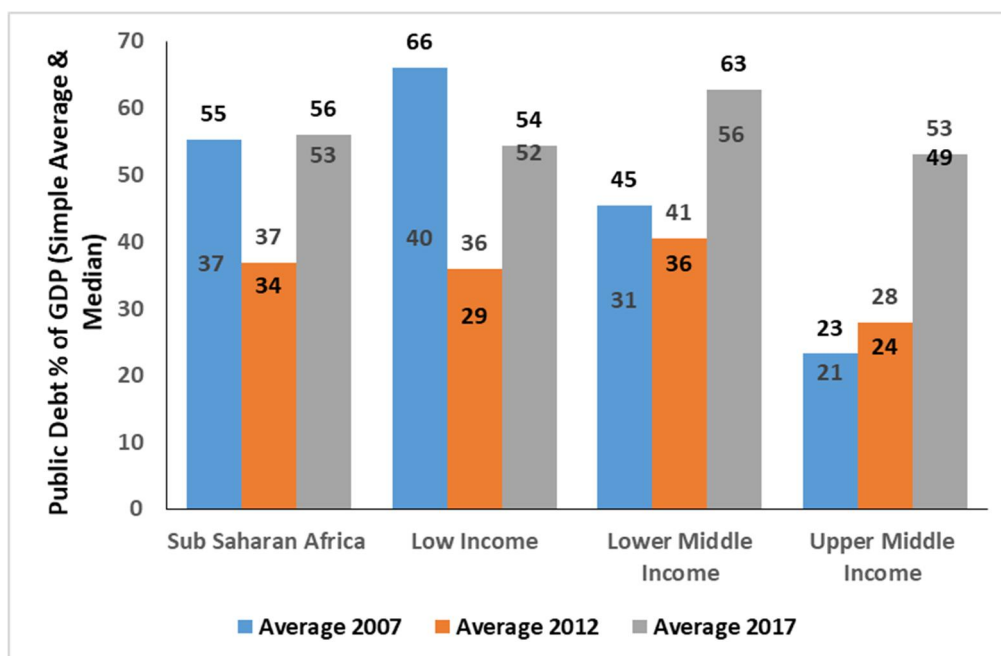
Source: Author's computation using IMF World Economic Outlook Database, April 2018

Note: Somalia, Mauritania and Sudan not included in analysis owing to data unavailability.

An analysis of countries' accumulation of public debt by resource dependence by WEO and IMF staff reveals that the increase in debt levels has been experienced in all categories of countries, but is more profound among oil exporting countries. Beginning 2012 to 2017, the average sovereign debt of exporters of commodities rose by 22 percentage points as the boom from commodity prices rise came to a halt and the economic situation worsened. Public Debt build up was pronounced for oil exporting

countries, with median debt/GDP more than doubling in a period of 4 years. Gabon and Angola have witnessed debt increase by over 100% while in the DRC the debt-to-GDP ratio has increased three times more from 2012 to 2017. Nigeria has sustained sovereign debt under 20% of GDP by the end of 2016. The level of government debt also shot up in certain small countries like The Gambia, São Tomé and Príncipe and Cabo Verde, to levels near or over 100 percent of GDP. World Bank Group, (2018)

Figure 5: Public debt by Resource Dependence in Sub Saharan Africa
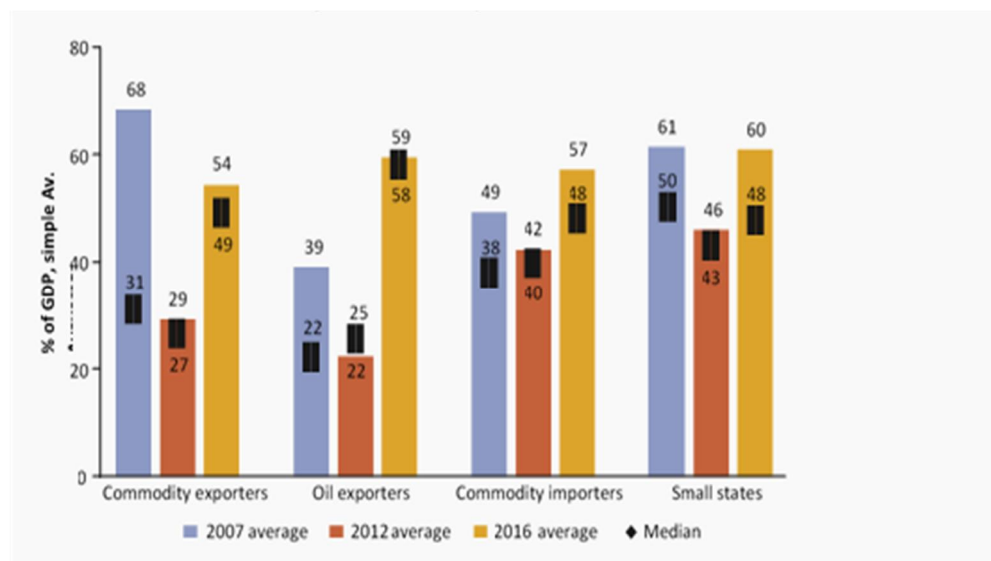
Source: World Bank's Africa's Pulse Report, 2018. WEO and IMF staff Calculations using International Monetary Fund WEO Database, 2017

3.3.3. Share of Public External Debt in Total Public Debt in SSA

The declining public debt levels in SSA from 2000 is due to public foreign debt since public internal debt accumulation rates remained relatively stable. Public external debt[3] has dominated the total sovereign debt although domestic debt has been increasing rapidly. In SSA region the median foreign debt was 30 percent by the end of 2017 down from 22% of GDP in 2012 while the median of local currency denominated debt was 25 percent share of GDP in 2017 rising from 12% share of GDP in 2012.

The simple average for public foreign debt was 30% of GDP in 2017 while domestic debt stood at 26 percent of GDP. Time series data for public domestic debt for SSA countries have been calculated for 41 countries by getting the difference of government debt and public external debt ratios by the author owing to lack of a consistent and reliable domestic debt database.

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[3] Public External Debt data is the Public and Publicly guaranteed external debt series obtained from World Development Indicators

Figure 6: Share of Public External Debt in Total Public Debt in SSA 2000-2017
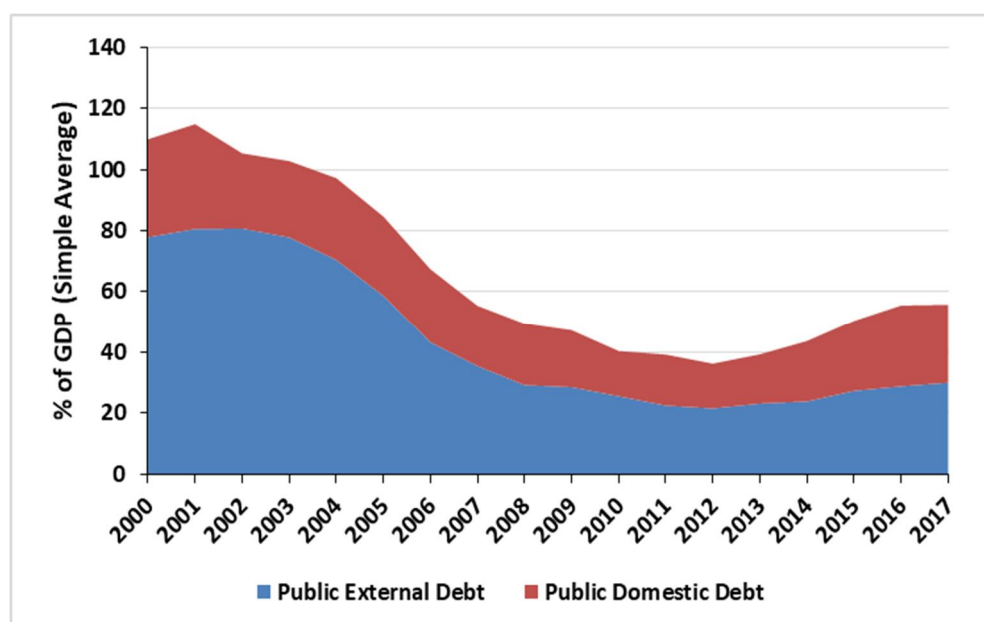
Source: Author's computation using World Bank World Development Indicators database, 2019

Note: Equatorial Guinea, Mauritania, Namibia and Seychelles not included owing to data limitations.

Increase in domestic debt is more noticeable in UMICs where median debt levels rose from 12% of GDP in 2012 to 30% by the end of 2017 for the 44 SSA countries. Among LICs and LMICs, build up was at lower rates of 1 and 11 percent of GDP respectively implying that UMICs have established and more developed domestic debt markets hence can raise more domestic debt financing. The figure 7 and 8 below shows public foreign debt and internal debt by income group in SSA respectively.

Figure 7: Share of Public External Debt by Income Group
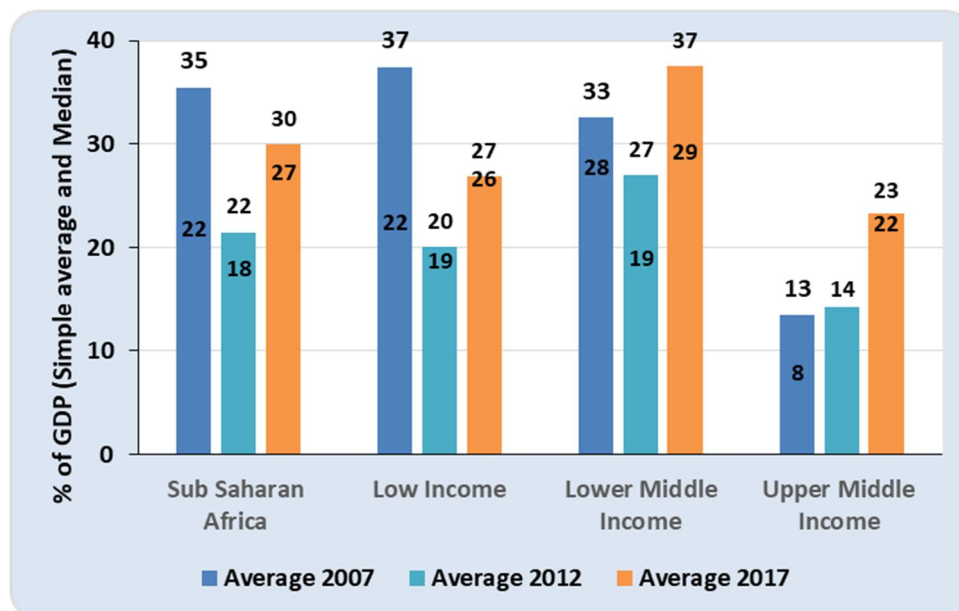
Source: Author computation using World Bank; World Development Indicators public external debt dataset

Note: Equatorial Guinea, Mauritania, Namibia and Seychelles not included due data unavailability.

Figure 8: Share of Domestic Public Debt by Income Group
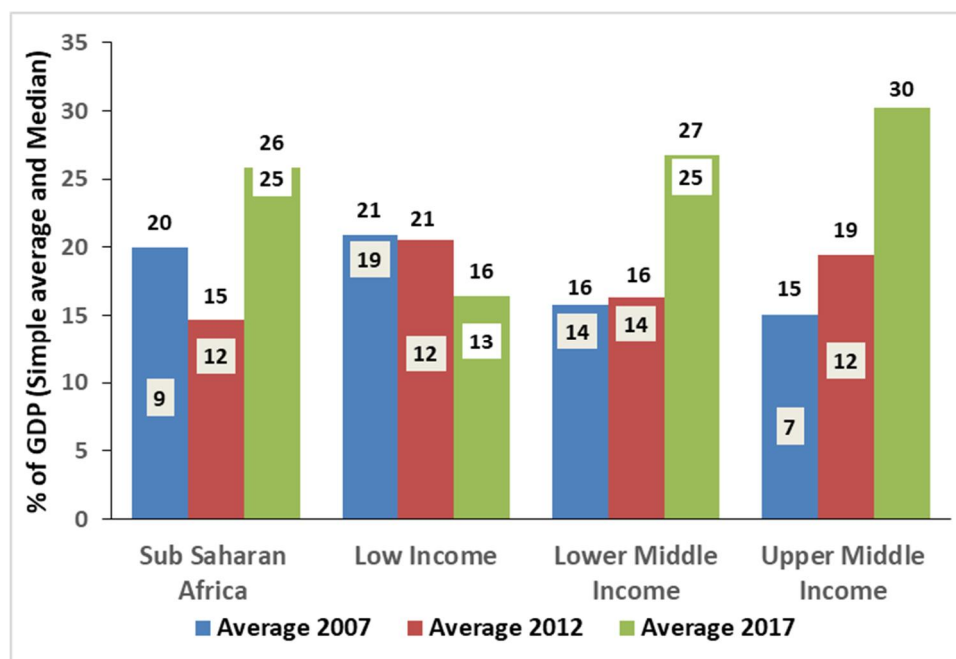
Source: Author's computation

Note: Equatorial Guinea, Mauritania, Namibia, Seychelles, Somalia, South Sudan and Sudan not included due to data limitations.

Foreign currency dominated debt dominance can be attributed to LMICs increased tapping of international capital markets. Over the recent past a number of countries in the region have issued sovereign bonds that are market-based at an alarming rate. These countries include Angola, Ghana, Kenya, Malawi and Côte d'Ivoire.

Table 1: International Bond Issuance in Sub Saharan Africa by 2015

Pricing Date	Issuer	Foreign Currency Rating	Face Value US$ (in mil)	Maturity Date	Coupon	Years of Maturity
2014	Cote d'Ivoire	B*	750	2024	5.625	10
2007	Ghana	B	750	2017	8.5	10
2013	Ghana	B	750	2023	7.875	10
2014	Kenya	B+	1500	2024	6.875	10
2014	Kenya	B+	500	2019	5.875	5
2013	Mozambique	B	500	2020	8.5	7
2012	Nigeria	BB-	500	2018	5.125	5
2013	Rwanda	B	400	2013	6.875	10
2011	Senegal	B+	500	2021	8.75	10
2014	Senegal	B+	500	2024	6.25	10
2013	Tanzania	NA	600	2020	6-mth LIBOR	7
2012	Zambia	B+	750	2022	5.375	10
2014	Zambia	B+	750	2024	8.625	10

Source: Standard and Poor's; B* refers to Fisch Risk Rating

Many African countries have also pursued funding from non-traditional bilateral lenders, especially China. From 2000-2017, the Chinese government, Banks like the EXIM Bank and contractors gave US$ 143 billion in loans to governments in Africa and their SOEs. Lukas Atkins, et al. (2017). Angola is the biggest beneficiary of loans from China where $42.8 billion was received over 17 year period. Although some loans meet "official development assistance" criteria, other Chinese loans are exports credits, suppliers' credits or commercial and not concessional in nature. Chinese lending windows and financing conditions are very varied, with several creditors such as the Chinese

development Bank, Exim-Bank, the Government of China, and the Chinese corporations including ZTE Electricity Company, China International Water Corporation, Poly Technologies Inc. China, and the telecom company HUAWEI. (*ibid*). The figure 10 below shows loans from China to Africa.

Figure 9: Chinese Loans to Africa 2000-2017
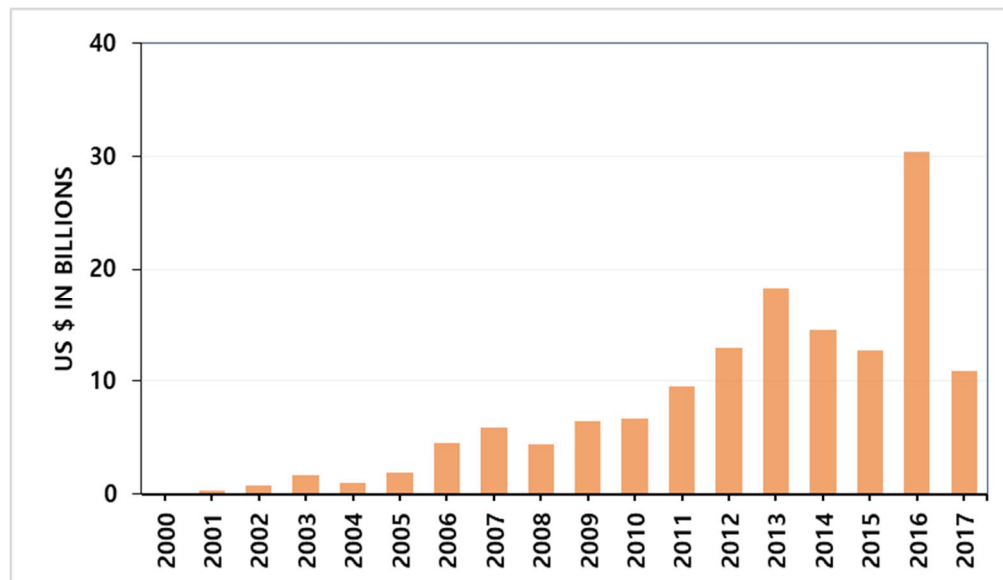
Source: Author Computation from China-Africa Research Initiative data; CARI, 2017

In conclusion, debt accumulation in Africa has been rising but not without significant heterogeneity across countries. Sixteen (16) countries of which Algeria, Botswana, Mali, and Burkina Faso have a debt/GDP ratio of less than forty percent with 6 countries that is Egypt, Eritrea, Sudan, Cabo Verde, Congo and Mozambique having a debt-to-GDP

ratio over 100%. Africa Development Bank, (2019). The conventional method of assessing sustainability of debt categorizes 16 African countries as "high risk" of or in debt distress. (*ibid*)

CHAPTER FOUR: RESEARCH METHODOLOGY

4.1. Introduction

This section therefore aims to elaborate the data, stylized facts, variables, econometric techniques and approaches carried out in the research to examine role of government debt on economic growth in SSA.

4.2. DATA AND STYLIZED FACTS

4.2.1. Data

In investigating the effect of debt related liabilities on growth, our study utilizes secondary data drawn mainly from World Bank's World Development Indicators (WDI), IMF's World Economic Outlook (WEO) and Worldwide Governance Indicators (WGI) online databases. Data for key variables such like growth rate of per capita GDP, labor, exports and gross capital formation (investment) and public external debt (public and publicly guaranteed external debt series) are obtained primarily from WDI, the gross government debt (public debt) from WEO, while public domestic debt is obtained by difference between the country's Public debt and public foreign debt owing to lack of a reliable and consistent domestic debt dataset that allows for cross country comparisons. Data measuring governance/institution quality is obtained from WGI. Sub-Saharan Africa is made up of forty eight countries though, due to data limitation with regard to key variables for some countries, empirical analysis on sovereign debt is based on 45

SSA countries.

The investigation targets a time period of 18 years (2000-2017) targeting period after MDRI to recent period where debt-GDP ratios have been burgeoning in the region. However, some period lack data in a number of countries.

4.2.2. Some Stylized Facts

Data on public debt and per capita GDP growth evidently indicate a negative relationship between government debt and real GDP per capita growth. Figure 10 below is a graph of government debt against GDP per capita growth average for subsequent six years for the Sub Saharan Africa region. The coefficient of the best line of fit is negative 0.0112. Going by its nominal value and assuming the likelihood of endogeneity biases and without control for key factors that determine economic growth, it points to the fact that a one percent point rise in public debt/GDP is linked to a subsequent drop in growth by 0.0112 percent points. As shown in the following chapter the negative correlation turns out to be quite consistent with the econometric analysis results.

Figure 10: Public Debt and Real per capita GDP Growth in SSA
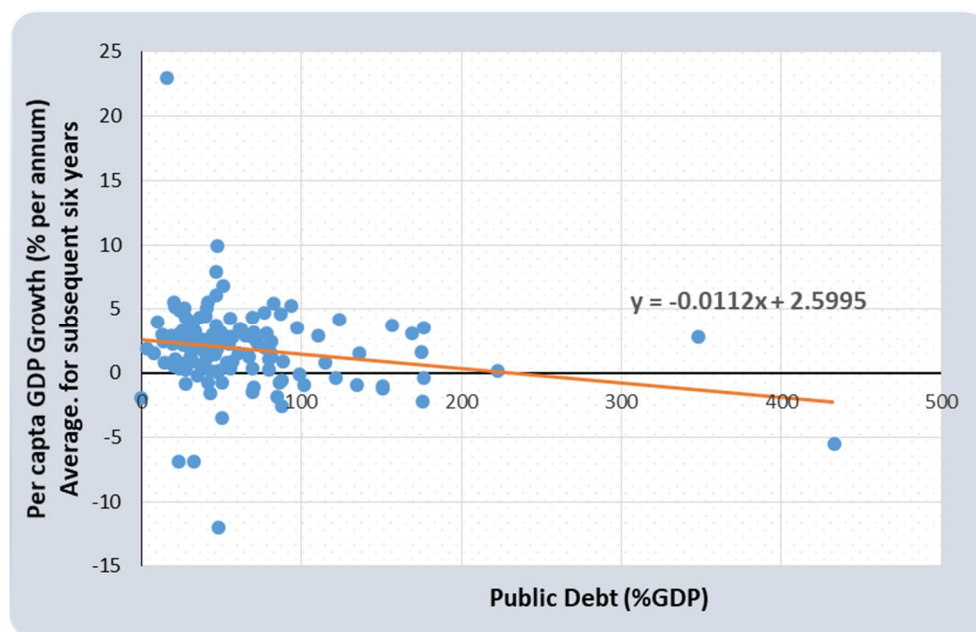
Source: Author computation using IMF WEO (debt) and WB WDI (per capita GDP) data

Data on public foreign debt and per capita GDP growth evidently indicate a negative relationship between foreign debt and real GDP per capita growth. Figure 11 below is a chart for public foreign debt against GDP per capita growth average for subsequent six years for the Sub Saharan Africa region. The coefficient of the best line of fit is negative 0.012. Going by its nominal value and assuming the likelihood of endogeneity biases and without control for key factors that determine economic growth, it points to the fact that a one percent point rise in public debt/GDP is linked to a subsequent drop in growth by 0.012 percent points

Figure 11: Public External Debt and Real per capita GDP Growth in SSA
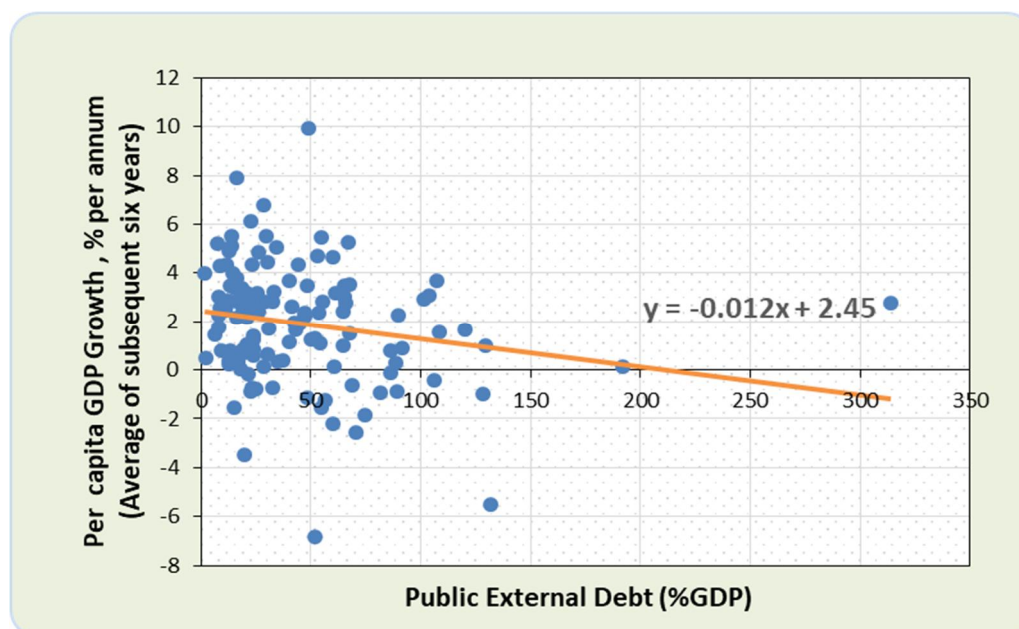
Source: Author computation using IMF WEO (debt) and WB WDI (per capita GDP) data

Using our computed dataset on public domestic debt and growth it's evident that a negative relationship between internal debt and real GDP per capita growth exists. Figure 12 below is a chart for public internal debt against GDP per capita growth average for subsequent six years for the Sub Saharan Africa region. The coefficient of the best line of fit is negative 0.006 about half that of internal debt. Going by its nominal value and assuming the likelihood of endogeneity biases and without control for key factors that determine economic growth, it is indicative of the fact that a one percent point rise in public internal debt/GDP is linked to a subsequent drop in growth by 0.006 percent points.

Figure 12: Public Domestic Debt and Real GDP Growth in SSA
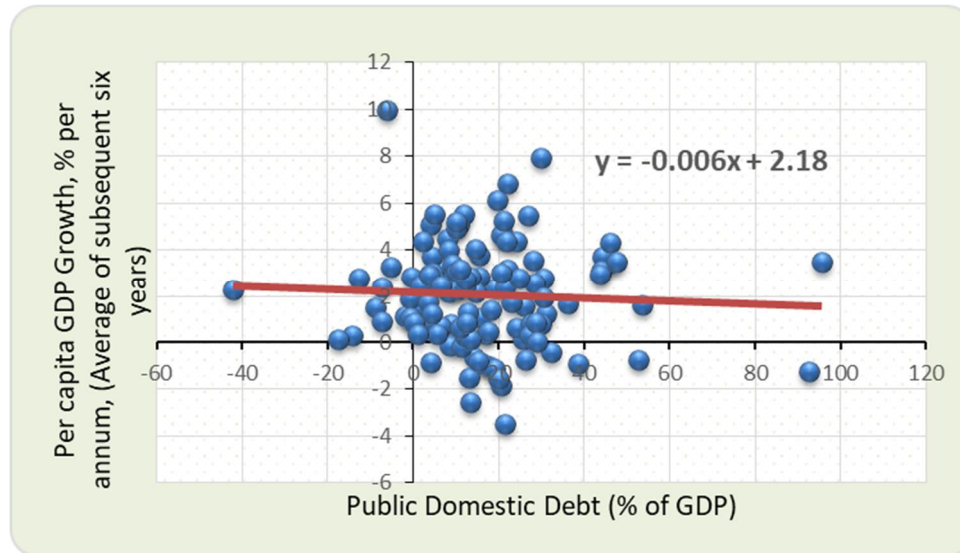
Source: Author computation using IMF WEO (debt) and WB WDI (per capita GDP) data

Analysis of public foreign debt and internal debt accumulation shows is that public external debt is positively correlated with domestic debt at 1 percent significant level. This implies that countries with larger public external debt borrow more even at the domestic markets in the region. Borrowing abroad and issuing sovereign bonds may be as a result of limited space at the domestic markets and for the region it complements internal debt owed to lenders within the country. The figure below depicts the correlation between public foreign debt and internal debt in SSA.

Figure 13: Correlation between public external and domestic debt
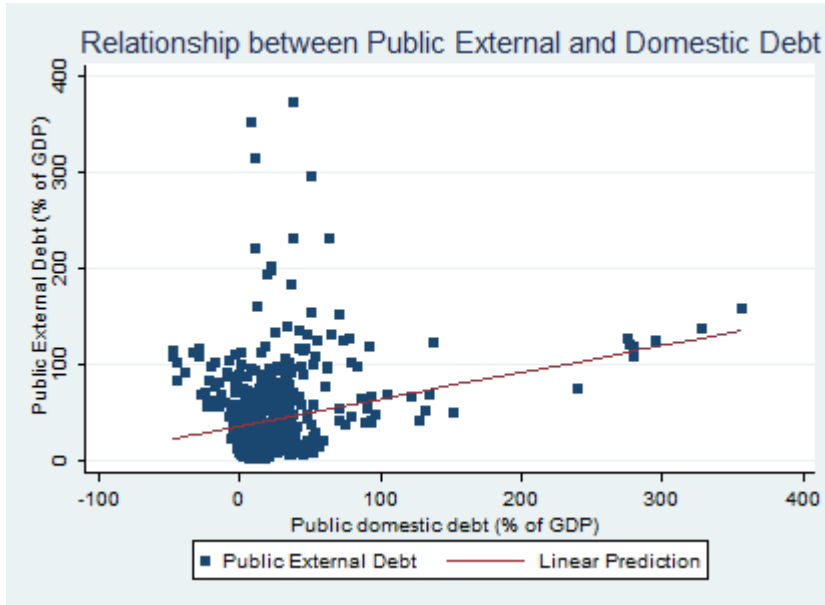
Source: Author computation using Stata 13.

The GDP per capita growth rate average for subsequent six years in high debt periods (beyond 90 percent) is clearly lesser than that in low public debt incidents (under 30 percent) among SSA countries. The average real GDP per capita growth in high public debt episodes is 2.5 percentage points which is more than 2.5 times less that in low public debt whose average is 0.97 percentage points.

Figure 14: Growth of Real per Capita GDP between High and Low Public Debt Episodes
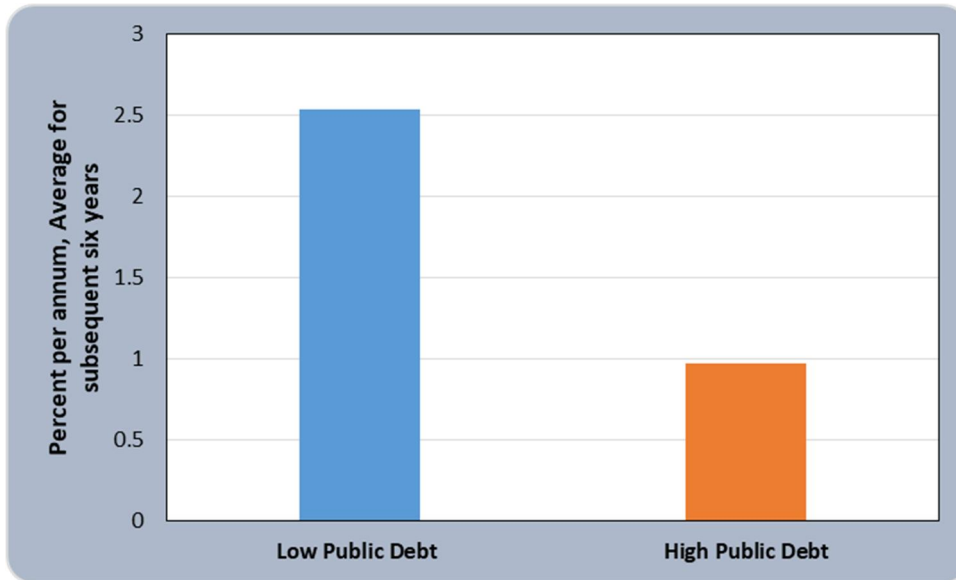
Source: Author computation using IMF WEO (debt) and WB WDI (per capita GDP) data

4.3. ECONOMETRIC METHODS

To evaluate direct impact of public debt on growth cross sectional-time series data for 45 SSA countries (Mauritania, Somalia and Sudan) lack gross government debt data for the period 2000-2017, we firstly specify an augmented production function following (Fosu, 1996) who expressed growth as a function of labor, investment and growth of exports. Then, we include our main independent variable (public debt) into a dynamic panel which is estimated with a two-step system GMM. The regression model is repeated on public foreign debt and public internal debt separately and then a complete dynamic

model with both.

4.3.1. The Augmented Production Function

$$Y_t = \beta_0 + \beta_1 l + \beta_2 k + \beta_3 x + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{(1)}$$

Where Y denotes the real GDP per capita growth, l denotes labor force growth, k is the capital accumulation growth, x represents growth rate of exports; ε denotes the disturbance term and β_0, β_1, β_2, β_3 are parameters to be estimated. Exports, a proxy for openness is added to labor and capital (Solow's Model) because it is widely accepted as a significant contributor to economic growth (see Fosu, 1990).

4.3.2. Differenced GMM and System GMM

Government debt and economic growth correlation is assessed using a system GMM estimation technique, OLS and fixed effect model. To resolve possible issue of endogeneity, we employ difference GMM suggested by Arellano and Bond (1991). The difference GMM approach takes first differences and uses the lagged repressors as instruments thereby eliminating the omitted country-specific fixed effects this intends to improve the consistency of the estimates. Sometimes, the unobserved country specific fixed effect may be vital but due to its elimination through differencing, the model might be wrongly specified and our instruments might be weak thereby undermining the asymptotic properties of the difference estimator. System GMM suggested by Arellano and Bover (1995); Blundell and Bond (1998) augments difference GMM by resolving the weak instruments problem by introducing two systems of equations, a differenced equation and an equation in levels. Because variables in level equation are instrumented

with their own first differences, more instruments can be obtained thereby increasing efficiency. Efficiency of the equation under estimation is improved if moment conditions of its level form and the differenced forms are combined (Roodman, 2009). The system GMM works on a strong assumption that the first-differenced instruments used for the variables in levels should not be related with unobserved country fixed effects. System GMM is designed within additional moment condition which is specified as follows:

$$Y_{it} = \beta_1 Y_{it-1} + \beta_2 w_{it} + \beta_3 w_{it-1} + \mu_{it} \dots\dots\dots\dots\dots\dots\dots \text{ (2)}$$

$$\mu_{it} = v_t + \varepsilon_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{ (3)}$$

$$\Delta Y_{it} = \beta_1 \Delta Y_{it-1} + \beta_2 \Delta w_{it} + \beta_3 \Delta w_{it-1} + \Delta\mu_{it} \dots\dots\dots\dots\dots \text{ (4)}$$

$$\Delta\mu_{it} = \Delta v_t + \Delta\varepsilon_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{ (5)}$$

for country, $i = 1,\dots N$, and time, $t = 1,\dots.T$.

Where Δ represents first differences operator, and Y_{it} and Y_{it-1} denotes real per capita GDP growth and its lagged values respectively; w_{it} and w_{it-1} is a matrix of all explanatory variables and their respective lags; μ_{it} is the error term which contains the unobserved country fixed effects v_t and ε_{it} the idiosyncratic disturbance terms, β_1, β_2, and β_3 are coefficients of instruments to be measured, t is the number of time periods available to each individual country i.

Lagging the dependent variable leads to serial correlation and to estimate consistent estimators for the instruments with further lags of the dependent variable, we check the null hypothesis of no serial correlation. At 1% level of significance, we reject the

Arellano and Bond AR (1) at first differences but fail to reject Arellano and Bond AR (2) at first differences implying no presence of autocorrelation. Furthermore, we report the Hansen test to confirm validity of instruments and detect over-identifying restrictions. Along with system GMM, OLS and FE estimators will also be applied.

4.3.3. Empirical Model Specification

The research employs a dynamic panel regression model in estimating role of public debt on economic growth in Sub-Saharan Africa. The predetermined variables in the model comprises lagged values of the dependent variable (growth rate of per capita GDP) and independent variable (specifically debt to GDP ratios) and governance effectiveness role on debt-growth relationship. The inclusion of lagged value of real GDP per capita growth rate incorporates the persistence of the variables in the estimation whilst lags of debt to GDP ratio captures the effect of government debt acquired in the previous years on current economic growth. Moreover, employing a dynamic panel model assist in accounting for temporal serial correlation, and reduce the chances of estimating an inflated or regression model.

Generally, a dynamic panel regression can be stated as below:

$$\mathbf{Y_{it} = \beta_0 + \beta_1 Y_{it-1} + \beta_2\ Y_{it-2} + \beta_3 x_{it} + \beta_4 l_{it} + \beta_5 k_{it} + \beta_6 d_{it} + \beta_7 d_{it-1} + \beta_8 d_{it-2} + \beta_9 d^2_{it} + \beta_{10} Governance_{it} + \beta_{11} d*Governance + \mu_{it}} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\text{ (6)}$$

Where:

Y denotes real GDP per capita growth, **l** is growth of Labor Force, **k** Gross Capital as a percentage of GDP, **x** is Exports Growth Rate, **d** is Public Debt as a % GDP, **d2** is Square of Government Debt as % of GDP, **Governance** is perception of quality of public services and policies percentile rank   of country's score ranging from 0 corresponding to lowest rank, and 100 to highest rank, **d*Governance** denotes debt*governance interaction, β_0 is a constant β's are Coefficients of instruments, μ is error term, *t* period/year and *i* specific country.

4.4. Description of Variables

Outlined below are some variables used in the empirical model giving explanations for use in the model and relationship among the regression variables.

4.4.1. Dependent Variable

4.4.1.1. Economic Growth (Y)

According to Todaro & Smith, (2012) "growth in the economy is the rise in the value of goods and services in the market, adjusted for inflation over time by the economy. Usually it is the increase in percentage in real gross domestic product (GDP), as measured in per capita terms". "It's the total final output of goods and services produced by the country's economy within the country's territory by residents and nonresidents,

regardless of its allocation between domestic and foreign claims". (Todaro P & Smith S, 2012). Per capita GDP is gross domestic product divided by a country's midyear population. This study adopts real GDP per capita growth as an indicator of economic growth like many studies have in investigating debt-growth relationship such as Kumar & Woo, (2010).

4.4.2. Independent Variables

4.4.2.1. Exports (x)

Increase in exports enhances economic growth as it improves resource allocation, economies of scale, job creation and also allows for technology transfer hence enhancing production techniques. This study employs annual growth rate of exports following Fosu (1999).

4.4.2.2. Labor (l)

According to World Bank WDI, labor "comprises people ages 15 and older who supply labor for the production of goods and services during a specified period. It includes people who are currently employed and people who are unemployed but seeking work as well as first-time job-seekers" (ibid). Increase in the labor force which is associated with population growth, has conventionally been taken as an economic growth promoting feature. (See neoclassical growth model). A bigger labor force translates to

more productive workforce, and a huge total population raises the scope of local markets. (Todaro P & Smith S, 2012). This study employs labor force growth rate proxy for labor.

4.4.2.3. Capital (k)

Capital is a key growth determinant. According to Harrod-Domar (AK) model, capital is as a result of savings that is invested so as to increase output and income. (Todaro P & Smith S, 2012). Capital stock is "the total net real value of all physically productive capital goods and make it possible for expanded output levels to be achieved". (ibid) Thus capital has a direct effect on production of goods and services. Among variables used as proxies for capital in literature includes gross capital formation, domestic investment to output ratio. This study utilizes gross capital formation data following studies of Naeem Akram, (2016 and 2017). "Gross capital formation consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories". (World Bank, WDI).

4.4.2.4. Public Debt (d)

Debt to GDP ratio quantifies debt burden of a country and also can indicate a country's resource base. Debt amortization is made out of imposition of taxes on current production of goods and services hence debt to GDP ratio varies proportionately with debt burden. Debt to GDP ratio is used to measure how sustainable a country's debt

servicing requirements is, although there are no explicit rules define what levels are too high. (World Bank WDI). However, studies on LIDCs indicate that debt servicing challenges are probable when the present value of debt stretches to about 200% share of exports. (ibid)

In measuring the effect of debt burden on economic growth, some ratios have been used in literature mainly foreign debt to export ratio, foreign debt-GDP ratio, foreign debt to reserves ratio and share of public debt-to-GDP ratio expressed as a percentage. Our study uses public debt to GDP ratio, public external debt to GDP ratio and public domestic debt to GDP ratio as a measure of debt burden. Some studies have proposed nonlinear correlation between debt and growth and in an attempt to investigate such relationship, the study uses the square of debt to GDP ratios and Quartile dummy for domestic debt.

4.4.2.5. Governance

This indicates the quality of governance or institutional quality and in particular this study employs government effectiveness. According to World Bank WGI "government effectiveness captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies". In this study it's used as a measure for governance to determine the role it has on debt-growth relationship in SSA.

Table 2: Summary of variables, Expected sign and Data Sources

Name of Variable	Comment	Expected sign	Data Source
Economic Growth (Y)	Per Capita GDP (real) Annual Growth (%)		WB
Investment (K)	Gross Capital Formation percent of GDP	Positive	WB
Growth rate of Labor force (l)	Population of age 15+ Annual Growth (%)	Positive	WB
Growth rate of Exports (x)	Exports Annual Growth (%)	Positive	WB
Public Debt (d)	Public Debt as proportion of GDP (%)	Positive	IMF
Public External Debt (ED)	Public and Publicly guaranteed foreign debt as a share of GDP (%)	Negative	WB
Public Domestic Debt (DD)	Public Debt to GDP minus Public External Debt	Positive	WB
Square of Public Debt (d^2)	Public Debt as a percentage of GDP squared		
Governance	Percentile rank of country's score ranging from 0 corresponding to lowest rank, and 100 to highest rank	Positive	WB
Debt*Governance	Public Debt Government Effectiveness interaction	positive	WB

Source: Author

CHAPTER FIVE: ESTIMATION OF RESULTS

5.1 Introduction

This section presents and discusses results from estimation of the direct role of public debt variables on economic growth in SSA. The empirical analysis on public debt uses 45 countries annual data, public external debt uses annual data on 44 countries while public domestic debt utilizes annual data of 41 Sub Saharan Africa countries for a 18 year period (2000-2017). The chapter has descriptive statistics and discussion of results sub sections.

5.2 Descriptive Statistics

The mean, standard deviation, maximum and minimum values of the variables are considered for our descriptive statistics.

Table 3: Descriptive Statistics of the Variables

Variables	Obs	Mean	Std. Dev.	Min.	Max.
Real Per capita GDP Growth Rate (%), Y	827	1.95	5.41	-47.59	56.79
Gross Capita Formation as % of GDP, k	779	22.02	9.69	0	61.47
Labor Growth Rate (%), l	840	2.69	1.10	-2.66	8.05
Exports Growth Rate (%)	700	8.23	22.73	-91.88	233.07
Public Debt as a % of GDP, d	782	64.16	61.24	0	514.92
Public External Debt as a % of GDP, ED	772	43.38	41.75	1.16	372.82
Public Domestic Debt as a % of GDP, DD	715	22.28	34.12	-47.11	355.63

Source: Authors computation using STATA 13.

Real Per capita GDP growth for the sub saharan Africa countries used in our study averaged 1.95 percent between 1990 and 2017 ranging from negative 47.59 percent to positive 56.79. The disparity can be linked to both domestic and external causes such as worsening overall fiscal balances and deteriorating commodity prices, global economic downturn etc.

The average investiment as a percentage of GDP proxied by gross capital formation is 22.02 with the ratio ranging bwtween 0 and 61.47 and a standard deviation of 9.49 for the study period. The disparity can be attributed to differences in the country's savings ratios and also low income countries need to undertake huge infrustructural investments in a bid to catchup with relatively high income countries.

Descriptive statistics for labor growth rate show an average of 2.69 percent ranging from negative 2.66 and 8.05 and a standard deviation of 1.10 during the same time.

The growth rate of exports averaged 8.23 percent per annum for the SSA countries for the period under study with the rate ranging from negative 91.88 to 233.07 percent per annum. The variations can be explained by contiued overreliance on traditional exports of primary goods by some countries exhibiting low exports growth rates while others have diversified exports as others have recently discovered natural resources.

Public debt as a percentage of GDP averaged at 64.16% for the period 2000-2017. The standard deviation is 61.24 with the range of the ratio being 0 to 514.92 percent of GDP for the same duration. The high average can mean significant debt burden and also resource base for the countries is in bad shape. The public debt is further decomposed into public external debt and public domestic debt. The average for public external debt

as a percent of GDP is 43.38 percentage of GDP with standard deviation of 41.75 percent. The minimum value is 1.16 percent while maximum value is 514.92 percent of GDP for the region for the period 2000-2017. The public domestic debt average is 22.28 percent of GDP with a minimum of negative 47.11 and a maximum of 355.63. This indicates that countries rely more on public external debt or foreign loans as relative to domestic markets. The higher income coountries also have more established domestic markets than the low income countries.

5.3. Results and Discussion

Outcome of the random effects, fixed effects and system GMM estimations on the empirical model earlier stated are presented under this section. The regression results are centered on a sample drawn from SSA countries for 18 year period spanning from 2000-2017. Discussion of regression results centres on the Sytem GMM estimation technique of the complete model.

5.3.1. OLS, FE and System GMM Estimations on the Dynamic Model

Table 4: Growth Regressions on Public Debt

Explanatory Variables	(1)	(2)	(3)
	OLS	FE	System GMM
Y-1 (Real Per capita GDP Growth rate)	0.138***	0.051	0.155
	(4.01)	(1.42)	(1.54)
Y-2 (Real Per capita GDP Growth rate)	0.020	-0.037	0.036
	(0.62)	(-1.11)	(0.78)
Gross Capital Formation % of GDP	0.083***	0.124***	0.081***
	(3.94)	(4.22)	(3.09)
Labor Growth Rate (%)	-0.449***	0.026	-0.395**
	(-3.04)	(0.13)	(-2.46)
Exports Growth Rate (%)	0.070***	0.069***	0.057***
	(9.86)	(9.69)	(4.63)
Public Debt % of GDP	-.066***	-0.075***	-0.05***
	(-4.32)	(-4.15)	(-2.65)
First Lag of Public Debt	0.049***	0.039**	0.039**
	(3.00)	(2.45)	(1.97)
Second Lag of Public Debt	0.014	0.022**	0.012
	(1.31)	(2.04)	(0.94)
Square of Public Debt	0.000	-0.000	-0.000*
	(-1.36.)	(-0.40)	(-1.91)
Governance	0.027*	-0.021	0.026**
	(1.88)	(-0.58)	(1.98)
Public debt*Governance	-0.000	0.0003	-0.0003
	(-0.56)	(0.75)	(-1.19)
Constant	-0.049	-0.755	-0.568
	(-0.06)	(-0.59)	(-058)
Number of Observations	560	560	560
Number of Groups		43	43
AR(2) (test for serial correlation)			0.507
Chi-Square (Hansen over-id test)			0.348
R-Square	0.325		
R^2 within		0.297	
R^2 between		0.223	
R^2 overall		0.262	

Source: Author computation using STATA 13.

*** and ** denotes statistical significance of estimates at 1% and 5%   respectively, z-scores (in italics) and t-statistics are in parenthesis.

Table 4 presents results from OLS, FE and SGMM estimations and indicate coefficients of public debt are negative and significant. A percentage point rise in public debt to GDP ratio inhibits growth by 0.066, 0.075 and 0.05 percentage points respectively at 1% significance level. The first lag of public debt-to-GDP ratio promotes per capita GDP growth by 0.05, 0.04 and 0.04 resp. percentage points at 5% significance level respectively holding other factors affecting per capita growth constant. The square of public debt is statistically insignificant in OLS and FE estimations while SGMM indicates there's evedence of nonlinearity. The OLS estimation also suggest government effectiveness promotes growth by 0.027 percentage points at 10% significance level and 0.026 percentage for system GMM while FE shows it's growth inhibiting but such effect is statistically insignifiicant. The role of government effectiveness on public debt-growth relationship reveals no significant effect in all estimations. Additionaly, the OLS and FE explain per capita growth at 32.5% and 29.7% respectively. Other control variables (capital, growth rate of exports) are as expected and significant at 1 percent unlike the growth rate of labor that has negative correration with per capita growth in SSA.

Table 5: Growth Regressions on Public External Debt

Explanatory Variables	(4)	(5)	(6)
	OLS	FE	System GMM
Y-1	0.191***	0.097**	0.217***
	(5.04)	(2.49)	*(3.24)*
Y-2	0.030	-0.048	0.038
	(0.82)	(-1.26)	*(0.64)*
Gross Capital Formation % of GDP	0.075***	0.103***	0.050***
	(3.99)	(3.69.)	*(2.31)*
Labor Growth Rate (%)	-0.255***	0.166	-0.221**
	(-1.70)	(0.82)	*(-1.51)*
Exports Growth Rate (%)	0.066***	0.067***	0.058***
	(9.46)	(9.38)	*(5.44)*
Public Ext. Debt % of GDP	-0.130***	-0.145***	-0.125***
	(-5.35)	(-5.40)	*(-4.19)*
First Lag of Public Ext. Debt	0.092***	0.082**	0.107***
	(4.00)	(3.62)	*(4.31)*
Second Lag of Public Ext. Debt	0.016	0.028	-0.005
	(1.18)	(1.96)	*(-0.27)*
Square of Public Ext. Debt	0.000	0.000	0.000
	(0.27)	(0.61)	*(0.042)*
Governance	0.019	-0.032	0.019*
	(1.63)	(-0.89)	*(1.85)*
Public Ext. debt*Governance	-0.000	0.0001	0.000
	(-0.09)	(1.47)	*(0.44)*
Constant	-0.183	-0.374	0.095
	(-0.26)	(-0.32)	*(0.11)*
Observations	575	575	575
Number of Groups		42	42
AR(2) (test for serial correlation)			0.634
Chi-Square (Hansen over-id test)			0.435
R-Square	0.304		
R^2 within		0.278	
R^2 between		0.106	
R^2 overall		0.232	

Source: Author computation using STATA 13.
*** and ** denotes statistical significance of estimates at 1% and 5% respectively, z-scores (in italics) and t-statistics are in parenthesis.

The OLS and FE growth regressions on public external debt shows that a percentage point increse in public external debt to GDP ratio inhibits GDP per capita growth by 0.13 and 0.145 percentage points in SSA respectively at 1% significance level. The system GMM estimates of public external debt is around similar magnitude of -0.125 and also significant at 1 percent level. The first lag of public external debt to GDP ratio promotes per capita GDP growth by 0.09, 0.08 and 0.11 percentage points resp. The square of public external debt and governance role on growth is statistically insignificant in all estimations while The system GMM estimations suggest government effectiveness promotes growth by 0.018 percentage points statistically significant at 10% level. Other control variables (capital, growth rate of exports) are as expected and significant at 1 percent unlike the growth rate of labor that has negative correration with per capita growth in SSA. The OLS and FE estimations explain per capita growth at 30.4% and 27.8% respectively.

Table 6: Growth Regression on Public Domestic Debt

Explanatory Variables	(7)	(8)	(9)
	OLS	FE	System GMM
Y-1	0.157***	0.059	0.172**
	(4.03)	(1.44)	(2.46)
Y-2	0.008	-0.075*	0.047
	(0.20)	(-1.90)	(0.83)
Gross Capital Formation % of GDP	0.068***	0.113**	0.054*
	(3.27)	(3.83)	(1.72)
Labor Growth Rate (%)	-0.403***	-0.064	-0.367*
	(-2.62)	(-0.31)	(-1.78)
Exports Growth Rate (%)	0.066***	0.066***	0.055***
	(9.19)	(9.15)	(5.34)
Public Dom. Debt % of GDP	**0.034**	**0.093**	**0.020**
	(0.74)	**(1.73)**	**(0.30)**
First Lag of Public Dom. Debt	0.016	0.012	0.009
	(0.86)	(0.67)	(0.39)
Second Lag of Public Dom. Debt	0.026**	0.039***	0.028**
	(2.03)	(2.88)	(2.43)
Quart_Dom* Public Dom. Debt	-0.025**	-0.041***	-0.020
	(-2.21)	(-3.14)	(-1.19)
Governance	0.006	0.020	0.006
	(0.50)	(0.64)	(0.44)
Public Dom. debt*Governance	0.0003	0.0002	0.000
	(1..00)	(0.34)	(0.96)
Constant	0.468	-1.70	0.095
	(0.75)	(-1.49)	(0.11)
Observations	**528**	**528**	**528**
Number of Groups		**40**	**40**
AR(2) (test for serial correlation)			**0.725**
Chi-Square (Hansen over-id test)			**0.216**
R-Square	**0.273**		
R^2 within		**0.252**	
R^2 between		**0.258**	
R^2 overall		**0.236**	

Source: Author computation using STATA 13.

***, ** and * denotes statistical significance of estimates at 1%, 5% and 10% respectively, z-scores (in italics) and t-statistics are in parenthesis.

The results from table 6, all estimations indicate public domestic debt has an positive effect on per capita GDP growth but such effect is insignificant. The quartile domestic debt interaction[4] coefficient is statistically significant for both OLS and FE estimations at 5% and 1% percent levels respectively but insignificant for system GMM estimator. Government effectiveness is growth promoting in both estimations but the effect is statistically insignificant. The domestic debt-governance interaction also indicates that for countries with better institutions, they are more likely to experience growth with high debt levels although such effect is insighnificant. Coefficients on other explanatory variables are positiive and mostly significant at 1 percent level as expected with the exception of growth rate of labor.

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[4] Quartile_Domestic debt dummy = 0 for minimum value of domestic debt, 1 if domestic debt falls in the first quartile, 2 for the median value, 3 if domestic debt falls in the third quartile and 4 for the maximum value of domestic debt; the relevant domestic debt percentiles are p25 = 7.38 percent, p50 = 15.00 percent and p75 = 27.56 percent.

Table 7: Growth Regression on Public External and Domestic Debt

Explanatory Variables	(10)	(11)	(12)
	OLS	FE	System GMM
Y-1	0.177***	0.074	0.199***
	(4.49)	(1.80)	*(3.44)*
Y-2	0.004	-0.074	0.039
	(0.12)	(-1.93)	*(0.68)*
Gross Capital Formation % of GDP	0.085***	0.117***	0.067**
	(4.04)	(4.02)	*(2.45)*
Labor Growth Rate (%)	-0.365**	-0.017	-0.345**
	(-2.85)	(-0.08)	*(-2.14)*
Exports Growth Rate (%)	0.061***	0.062***	0.051***
	(8.81)	(8.81)	*(5.94)*
Public External Debt % of GDP	-0.108***	-0.106***	-0.080***
	(-3.85)	(-3.27)	*(-2.78)*
Square of Public External Debt	0.000	-0.000	-0.0001
	(0.01)	(-0.07)	*(-0.90)*
Governance	0.014	0.001	0.017
	(0.97)	(0.03)	*(1.29)*
Public External debt*Governance	-0.0003	0.000	-0.0003
	(-0.74)	(0.39)	*(-1.69)*
Public Domestic debt % of GDP	0.011	0.052	0.028
	(0.24)	(0.91)	*(0.50)*
Quart_Dom*Domestic Debt	-0.018	-0.029	-0.021
	(-1.60)	(-2.10)	*(-1.65)*
Public Dom Debt* Governance	0.0004	0.0005	0.0003
	(1.14)	(0.60)	*(1.40)*
Constant	-0.11	-1.335	-0.285
	(-0.01)	(-1.02)	*(-0.32)*
Observations	**528**	**528**	**528**
Number of Groups		**40**	**40**
AR(2) (test for serial correlation)			**0.770**
Chi-Square (Hansen over-id test)			**0.507**
R-Square	**0.331**		
R^2 within		**0.306**	
R^2 between		**0.297**	
R^2 overall		**0.292**	

Source: Author computation using STATA 13.

*** and ****** denotes statistical significance of estimates at 1% and 5% respectively; z-scores (in italics) and t-statistics are in parenthesis.

Note: Both public External and Domestic debt regressors are lagged to two periods, time dummies are also included in all regressions

The table above reports RE, FE and System GMM estimations on the complete dynamic model (incorporating both public external and domestic debt). Our main estimator is the system GMM. The Arellanno-Bond test AR(2) in the first differences accepts the null hypothesis of no second-order serial correlations in the residual terms since p-value is equal to 0.77. Hansen's Chi-squared test checks overall validity of instruments used by system GMM estimation model are also valid as p-value is equal to 0.507.

The results for equation (12) indicate that a one percentage point rise in public external debt inhibits growth by 0.08 percentage points at 1 percent level of signifiicance. Similar to findings e.g (Akram, 2016) suggesting possibility of existence of debt overhang effect in which countries armotize debts with resources domestically mobilised leavinng not much to invest. One percentage point increase in public domestic debt promotes growth by 0.03 percentage points but such effect is statistically insignificant. The implication of this is twofold. On one hand it may be as a result of smaller proportion of public domestic debt in Sub Saharan Africa relative to public external debt or two as pointed out by (Akram, 2016), the fact that internal debt is ordinarily used enhance expansion of financial markets that mitigate the banks from unfavourable external volatilities and mitigate foreign exchange risk. The benefits account for macroeconomic stability which

is growth promoting.[5]

The squared public external debt to GDP ratio and quart_Dom*domestic debt dummy which is meant to capture domestic debt growth impact of various sizes of domestic debt following the work of (Abbas, 2010), have coefficients that are statistically insignificant. This confirms no nonlinear relationship exists between either of them and growth in SSA. Government effectiveness is growth promoting in the estimations but such effect is statistically insignificant. The public external debt-governance interaction results show that in high debts good governance is 0.0003 percent more growth-inhibiting while for domestic debt good governance is 0.0003 percentage points growth promoting but such effect is statistically significant.

The Solow neoclassical growth model suggests that developing countries will conditionally catch up with advanced econonomies to the same income levels if they have the similar savings rates, depreciation, growth of labor force and productivity growth. (Todaro P & Smith S, 2012). The savings lead to capital accumulation a crucial determinant of growth. Our estimation results reveal that capital as a percentage of GDP has a positive effect on economic growth at 1 percent significance level implying that an increase by one percentage point in capital as a percent of GDP will, increase growth by 0.07 percentage points other aspects held constant. The result meets

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[5] Naeem A, (2016) analyzed role of both public external and domestic debt for 4 Southern Asia countries and found impact of domestic debt to be positive and significant on economic growth and concludes it aids in development of internal financial markets and shields banks from unfavorable external shocks and foreign exchange risks among other benefits that are growth promoting.

expectation of our study.

The growth rate of exports estimation results reveal that an increase of one percentage point in exports growth increases economic growth by 0.05 percentage points at 1% significance level as well in SSA. This is similar to exitant findings of e.g Fosu (1999) who cited exports as an important growth augmenting variable.

The labor growth rate coefficient is counter intuitively negative indicating that 1 percent increase in labor force growth discourages growth of GDP per capita by 0.3 percentage points. The result is not in line with neoclassical growth models that affirm labor force as a determinant of growth. This suggestively may imply little investment in improving human resources for instance through technical and vocational training, formal education and in service training etc. to increase its productivity and thus having the similar or better potent outcome on output just like increase in working population in SSA.

The Lags of per capita GDP Growth were integrated into our dynamic model to assess how initial years' per capita GDP growth may affect the current one in SSA. Estimation results by system GMM shows that the first lag of per capita GDP growth promotes current per capita GDP growth by 0.199 percentage points at 1 percent significance level while the second lag affects current growth by 0.04 percentage points but statistically insignificant.

5.4 Hypothesis Testing and Conclusion

The system GMM estimator results show that public debt has a negative effect on economic growth in SSA and we thus reject our null hypothesis . Decomposition of public debt into public external debt and domestic debt and applying them in our dynamic model as regressors revealed that the former is significantly growth inhibiting (debt "over-hang" effect) while the latter positively affects growth in SSA even though statistically insignificant. The study also indicated no evidence of nonlinearity of debt in our complete dynamic model. Government effectiveness is growth promoting according to our estimations but such effect is statistically insignificant. Other explanatory variables i.e. capital and growth rate of exports are positive and have high significance on economic growth unlike labor force growth rate that negatively affects growth in the SSA region.

CHAPTER SIX: CONCLUSION AND POLICY RECOMMENDATIONS

6.1 Introduction

In this chapter, summary of key results and implications in terms of policy based on the findings from our research are highlighted.

The study sought to analyse role of public debt on growth in Sub Saharan Africa for a 18 year-period (2000-2017) employed a 45 SSA countries sample. We also employed the system GMM as our main estimator on a dynamic model incorporating both public external debt and domestic debt to investigate the effect on growth in SSA.

6.2 Summary of Key Findings

From the data we find that the region has public debt over 55% of GDP as of 2017 with public external debt taking larger part of the public debt at 33% of GDP compared to 22% to GDP of public domestic debt for 42 countries with data. This is testament to an existence of the financing gap that exists between investment needs and level of savings in the region.

We also established that although debt build up was across all income groups in SSA it is more pronounced in LMICs for public external debt and in UMICs for public domestic debt. Foreign debt accumulation in the region is also posively correlated with internal debt an indication that the sources of funding are complementary and not substitutes to

each other.

A lot of empirical literature exist on debt-economic growth nexus albeit few studies have examined public debt especially in SSA. Most of the researches put emphasis on role of total ecternal debt on growth owing to date availability supposedly. Studies on influence of public debt on growth are mainly focused on advanced economies and emerging market economies of Asia.

Our study employed system GMM estimator which has capacity to overcome biases in a panel data on a recent data to analyse public debt-growth nexus in SSA considering hot debates and cocerns raised over sustaining growth momentum in the region amid ballooning public debt to GDP levels.

The estimation result shows clearly public debt has a negative and significant effect on growth (contemporaneous result). Decomposing public debt into public external debt and domestic debt and applying them as regressors shows public external debt has a negative impact on growth indicating that the region could be facing debt over-hang conditions in which considerably large local resources or foreign capital are mobilised to armotize debt leaving little resources for investment. Public domestic debt to GDP has positive effect on growth confirming its role in macroeconomic stability and guarding against external shocks which is crucial for growth of the conomy.

The findings also indicate that debt-governance interaction has no significant influence on the effect of debt-growth relationship suggesting therefore what matters is how the debt is actually used and in which growth channels.

6.3. Policy Recommendation

Our main empirical finding is public external debt is negatively correlated with economic growth in SSA suggesting debt overhang effect while public domestic debt promotes growth. Although borrowing goal is economic growth, huge debts may affect private investments for fear of high tax risks in order to pay for the debts. Lions share of contracted loans in LDCs could be majorly used on input expansion. According to Neoclassical growth models, capital deepening is classified as a short term source of growth approximately 15 to 20 years because its subject to diminishing returns. Emphasis should therefore be laid on long-term sources of growth channels i.e. productivity growth and human capital development.

The SSA countries should endeavor to develop their domestic markets to avoid over reliance on foreign loans.

Measures should be put in place to mobilize domestic resources to increase government revenues for instance by instituting measures to fight corruption and curb tax evasions.

The use of Public Private Parterships (PPPs) can be an effective way of financing and also resource mobilization tool in the quest to bridge the huge gap of infrustructure in the developing Sub Saharan Africa.

Our estimations revealed that exports growth rate have high positive correlation with growth hence hence SSA countries should adopt export led strategies that are in turn funded with debt. The strategies should generate more returns to armotize the debts without necessarily having to result to tax revenues for loan repayments.

6.4. Limitations of the Study

In most developing economies such as African, the unrecorded economy is so large and therefore so economically significant that to leave it undocumented is not satisfactory. The inclusion of the unrecorded economy in the national accounts as GDP has been constrained by the availability of data. (Jerven, 2013).

The research admittedly is inadequate in explaining causality between public debt and economic growth whether its debt that causes underdevelopment or the reverse of it in the Sub Saharan region. To carry out a causality test a relatively longer period is required preferably over 30 years. It is hereby suggested that a future research be undertaken to test the causal relationship between public debt and economic growth for the SSA region. Analysis should also be done to determine through which growth channels the domestic debt does promote economic growth in Sub Saharan Africa.

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APPENDICES

Appendix I: GDP per Capita Growth (Annual) and Public Debt (Simple Av. % of GDP) in Sub Saharan Africa 2000-2017

Year	GDP Per Capita Growth (Annual)	Public Debt (Average)
2000	0.83	110
2001	1.57	118
2002	3.62	110
2003	1.54	110
2004	3.75	102
2005	3.44	89
2006	3.33	72
2007	3.78	60
2008	2.53	53
2009	0.28	47
2010	2.74	40
2011	1.64	38
2012	1.21	38
2013	2.20	40
2014	1.87	45
2015	0.10	53
2016	-1.47	56
2017	-0.18	56

Source: Author Computation with data from IMF, World Economic Outlook Database, October 2017 and World Development Indicators

초록

본 연구는 국가채무가 경제성장에 주는 영향을 다루고 있다. 본 연구의 2000년도부터 2017년까지, 18년에 거쳐 사하라 사막 이남의 아프리카 국가(SSA)들에 대한 패널분석으로 이루어졌다. 국가 대외 부채 및 국내 부채의 영향도 분석하였다. 더 나아가, 부채-성장 관계의 제도적 질을 보장하는 대리로서의 국가 효과서으이 역살을 살펴보았다. 이를 분석하기위해 본 연구는 GMM 시스템을 주 평가 도구로 사용하고 성장에 영향을 주는 다른 변수들을 통제한 상태에서 실증적 분석을 한 결과 SSA지역은 부채와 경제성장이 역의 관계를 나타내고 있음을 확인할 수 있었는데, 평균적으로, 국가 부채 대 국가총생산(GDP)의 비율이 1 퍼센트 증가하는 것은 1인당 국가총생산(GDP per capita)의 성장률이 0.05 퍼센트 축소하는 관계를 나타내고 있다. 추가적으로 본 연구의 분석에 의하면 부채와 성장 간의 비선형적 관계가 나타나고 있으며 부채가 높을수록 국가총생산에 대한 비율이 더욱 심한 현상을 나타내고 있다. 부채-성장의 관계에 대한 좋은 정책은 중요하지 않은 것으로 나타났고, 이는 곧 부채를 어떻게 다루는지가 더 중요하다는 것을 시사한다.

그러나 본 연구의 주 결과는 국외 부채가 경제 성장에 악영향을 미치는 것으로 나타났지만 국내 부채는 통계적으로 유의미하지는 않더라도 오히려 긍정적인 효과를 보여주는 것으로 나타났다. 이는 곧 국내 시장이 미시경제적

안정성을 높여주고 외부 통화 충격을 완화시키며 경제 성장을 유도하는 금융시장의 자유화를 유도하기 때문인 것으로 나타났다.

그 결과, SSA 국가들의 정부들은 국내 시장에 투자하여 부채를 관리하고 외국채에 대한 과한 의존성을 줄이는 것을 권장한다. 탈세 및 부패를 줄이는 등 국내 자원을 동원해 정부 총세입을 증가시키는 방안들도 도입되어야 한다.

주제어: 국가부채, 경제성장, 사하라 이남 아프리카

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