UNIVERSITY OF CAPE COAST

EXTERNAL DEBT, CAPITAL EXPENDITURE AND ECONOMIC GROWTH IN SUB-SAHARAN AFRICA

MUMUNI LOGGU-NAA

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BY

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Thesis submitted to the Department of Economic Studies of the School of Economics, College of Humanities and Legal Studies, University of Cape Coast, in partial fulfilment of the requirements for the award of Master of Philosophy Degree in Economics.

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DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this University or elsewhere.

Candidate's Signature …… Date ……

Candidate's Name: Loggu-Naa Mumuni

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature: Date: …….

Principal Supervisor's Name: Dr. Camara K. Obeng

Co-Supervisor's Signature ……. Date ……...

Co-Supervisor's Name: Dr. Eric Amoo Bondzie

ABSTRACT

This study examined the joint effects of external debt and capital expenditure on economic growth. Using panel data of 37 SSA countries for the period of 2000–2020, the study found a negative relationship between external debt and economic growth, capital expenditure and economic growth, but a positive effect of the interaction between external debt and capital expenditure on economic growth. Therefore, the study recommended that externally borrowed funds by countries in SSA should be invested in productive ventures with prudent management to ensure economic growth and development. More importantly, governments of SSA should utilise fiscal and monetary policy efficiently to ameliorate the over dependence on external borrowings in financing their economic activities.

KEY WORDS

Capital Expenditure

Economic Growth

External Debt

Gross Domestic Product

Sub-Saharan Africa

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DEDICATION

To my family

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

AERC	African Economic Research Consortium
AFDB	African Development Bank
AR (1)	Arellano-Bond Test for First Difference Serial Correlation
AR (2)	Arellano-Bond Test for Second Order Serial Correlation
ARDL	Autoregressive Distributed Lag
BIS	Bank for International Settlement
DOH	Debt Overhang Hypothesis
ExDebt	External Debt Total
ECM	Error Correction Model
FDI	Foreign Direct Investment
FE	Fixed Effects Estimation Technique
CapExp	Government Capital Expenditure
GCapF	Gross Capital Formation
GDP	Gross Domestic Product
GMM	General Method of Moments
HIPC	Highly Indebted Poor Countries
ILO	International Labour Organisation
IMF	International Monetary Fund
ISSER	Institute of Statistical, Social and Economic Research
LCH	Liquidity Constraint Hypothesis
LDCs	Less Developing Countries
OLS	Ordinary Least Squares
RE	Random Effects Model

RGDPpc	Real Gross Domestic Product Per Capita
SSA	Sub-Saharan Africa
VECM	Vector Error Correction Model
WB	World Bank
WDI	World Development Indicators
WEO	World Economic Outlook

CHAPTER ONE

INTRODUCTION

Background to the Study

Historically, debt crisis has had some consequential effects on economies of countries across the world. Borrowing is done both internally and externally to enhance growth. However, most countries instead suffer from huge debt accumulations through excessive borrowing combined with debt sustainability factors. Many developing nations have high external debt levels and have been held prisoner by a range of internal and foreign causes. There were a number of contributory factors, including high global interest rates, shifts in terms of trade and unsustainable economic policy. The official leaders of creditor countries began to agree in 1985 on a more favorable and long-term solution to the debt crisis. This was done in order to nudge heavily indebted countries toward growth-oriented structural reforms, and it succeeded. Most countries that had been hit by a debt crisis for several years were still grappling with huge debts. To most developing countries, the 1980s became a "lost decade" when it came to economic development (Boughton, 2000).

A country's debt, as defined by Bove (1992) consists of all bonds and other securities that the government has as outstanding payments to be made. There are two compositions of debt. First is the source of the debt. That is either the debt is from internal or external sources. Second is the maturity of the debt. There are two ways to increase public debts: externally and internally. Outside of the country, the government owes money to investors, while inside the country; the government owes money to domestic investors.

Debts owed to people and institutions of in the same nation are known as domestic debt. Generally, loans are contracted to raise money to finance economic development activities. Governments contract loans to finance national budgets deficits or expenditures that are not covered by the limited domestic revenue, and also to improve economic conditions by solving macroeconomic problems such as unemployment problems. Despite the host of reasons for countries to contract loans, scholars in economics and financial authorities argue that nations should not record higher levels of debt, because higher debts can be inflationary with its accompanied unfavourable economic indicators. Another area of debt worthy of concern to researchers is the capacity of a nation to service its debt (Cavanaugh, 1996).

However, according to Gana (2002), foreign borrowing is beneficial if these funds are invested in areas that will help the economy grow and develop. The literature in economics has argued that developing countries should borrow at a reasonable level in order to boost economic growth. Developing countries borrow to supplement their scarce domestic resources. It is because of this that these nations have to pay higher interest rates on the money they borrow.

In furtherance, Sub-Saharan Africa experience public debt in an exacerbating position. This state of debt culminated in countries inability to generate enough revenue. First and foremost, the study nations' debt levels have steadily decreased as a consequence of the assistance and debt relief provided to other deeply indebted impoverished countries in the region. They also saw a gradual drop in new foreign debt obligations' maturity and grace period during this time. However, the nations' average interest on their

external debt obligations deteriorated, although it remained lower than the average for impoverished countries that are not deeply indebted in Africa and nations with low per capita incomes. Concessional debt and maturation were decreased for countries. These nations' debt load was further exacerbated by increasing interest rates and longer grace periods (IMF, 2018).

Debt sustainability, as outlined in the joint World Bank–IMF framework for African nations, is aimed at ensuring that low-income countries are able to meet their repayment obligations on government loans. Debt distress is a major concern, and the methodology is designed to analyze the long-term viability of debt. To avoid low-income nations falling into debt traps, the present framework has to be re-examined. When evaluating a country's debt sustainability, consider its current debt. African nations have a difficulty in their attempts to fund national development objectives and the 2030 Agenda for Sustainable Development in maintaining external debt sustainability (World Bank, 2020).

The external debt has hampered the progress in SSA for decades. The debt servicing burden coupled with the limited revenue mobilization drive against the huge expenditure gaps put the economies in the sub-region in difficult position. Economic growth and progress are stifled as a consequence of this. Government debts in SSA have seen a continuous rise for many years. From the year 2014 the SSA government debt averaged 32.7 and by the 2020, the debt percentage of GDP in SSA averaged 57.8 percent of GDP. There was a quarter of the region's GDP in debt by 2020. Moreover, half of the area's debt was owed to other parties outside the region, including bilateral creditors, multilateral creditors, and holders of Eurobonds. Increase in real GDP per

capita was minus 4.2 percent in 2020, down from 0.8 percent growth in 2018 and 2019. (IMF, 2021).

Table 1: Debt, Expenditure and Growth in SSA

	2014	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Government Debt-to-GDP	32.7	38.7	43.3	45.5	48.3	51.5	57.8
Government Expenditure-to-GDP	22.8	21.5	20.7	45.5	48.3	21.5	22.8
Real Per capita GDP Growth	2.7	0.8	-0.8	0.7	0.8	0.8	-4.2

Source: Loggu-Naa (2022).

Public spending on infrastructural development largely leads to a boost in economic growth. Infrastructure development refers to spending on vibrant areas of the economy such as roads, hospitals, ridges, ICT, power, water, and sanitation.

In many developing countries, a lack of infrastructure is a fundamental barrier to economic progress, according to Christian (2011). Investment in infrastructure, especially in Africa, may be prohibitively costly. To keep the economy growing and reducing poverty, more investment is needed (Christian, 2011).

Nearly two-thirds of nations in the sub-region spend less than 5% of their GDP on infrastructure, according to a World Bank assessment released in 2020. The bulk of government spending is made up of current expenses, such as the payment of salaries and wages, subventions to government agencies, and other administrative costs (World Bank, 2020).

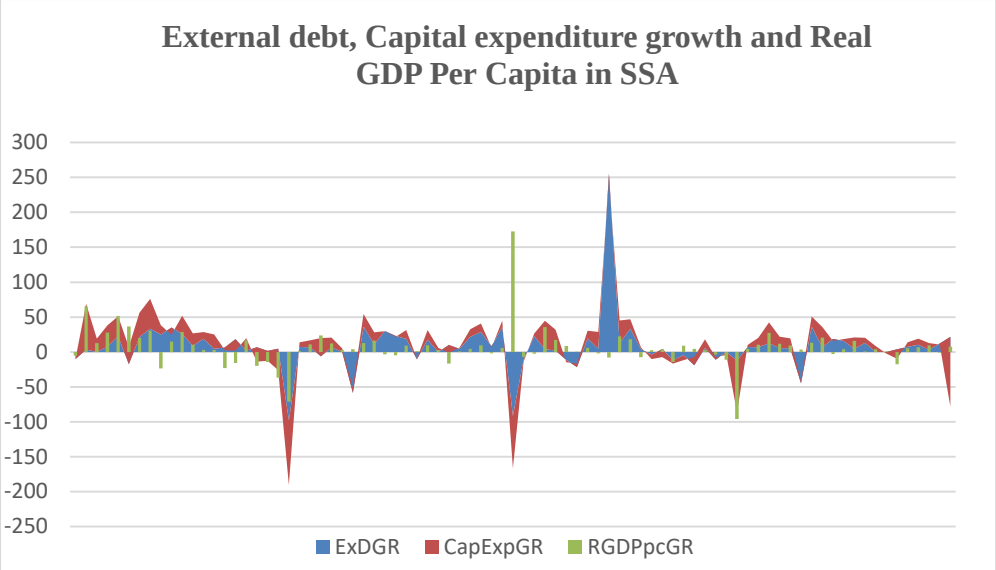

Figure 1: Trends of Debt, Expenditure and Growth in SSA

Source: Loggu-Naa (2022).

Statement of the Problem

There is a growing worry among economists and policymakers throughout the world about the growing burden of public debt. Public debt has been studied extensively by a wide range of experts and organisations, yet there are still many unanswered questions. For additional proof, the quantity of research on public debt in the global economic space gives adequate evidence for more studies and analysis in this field.

The consequences of the alarming external debt stocks on the economies in SSA have become a concern for researchers and economists, and analysts about the growth and development of these countries now and in the future. In light of the impending global pandemic of covid-19 and the resulting economic and financial crises, this topic has taken on critical significance. The cost of production may be reduced if borrowed money are utilized to invest in physical capital, such as machinery and technology, that is available to employees in the form of physical capital (Effiong, 2016; Ofori-Abebrese et

al., 2017). Debt at levels of 20% and 60%, has negative impact on growth, according to Egert, (2013). Other researchers have found a link between debt and stagnation, including Reinhart and Rogoff, Carner, Grennes, and Koehler-Geib, as well as Egert, Kumar, and Woo, (2010).

Other studies discovered a link between rising debt levels and increased economic growth. Burnsode and Dollar (2000), for example, found that foreign government borrowing is favourable for the economy only if macroeconomic policy was successful. Furthermore, Imbs and Ranciere (2005) found that low debt levels of less than 20% of GDP and 50% of exports has favourable and substantial influence on growth.

Debt, capital investment and economic development has been theoretically clouded with uncertainty. For years, scholars and researchers in the field of public debt have debated whether or not capital investment has a good or negative impact on economic development. Academics such as Folster and Henrekson (2001), Modebe et al. (2012), and Nasiru (2012) claimed tha tcapital investment has a negative effect.

Besides, other authors like Donald and Shuaglin, (1993), Niloy, et al (2003), Ranjan and Sharma (2008), as well as Muritala and Taiwo (2011) arrived at positive results. In addition, Appiah (2014) and Aigheyisi (2013) concluded that capital expenditure is influenced by external debt levels in a country. Contrary to popular belief, numerous scholars have taken the opposite position (Gupta et al, 2002).

Moreover, available research findings show that there is no widely acknowledged conclusion about how debt is linked to capital investment and the two have influence economic growth. Notwithstanding the different

approaches and scope by various researchers in their studies. This study sought to investigate foreign debt and economic progress in SSA nations. Using the one-step differenced dynamic GMM model and extended dynamic GMM estimates. Finally, this study will help provide sufficient evidence to answer the fundamental issue of whether borrowed resources are invested on capital expenditure or spent on current expenditure.

Purpose of the Study

The analysed growth considering its influence on external borrowing used to finance capital projects in SSA.

Objectives of the Study

The objectives of the study were to:

1. investigate the effect of external debt on economic growth in Sub-Saharan Africa.
2. examine the effect of capital expenditure on economic growth in Sub-Saharan Africa.
3. estimate the joint effect on economic growth by external debt and capital expenditure in Sub-Saharan Africa.

Hypotheses of the Study

The study poses the following hypotheses:

1. Null hypothesis (Ho): External debt does not affect economic growth in Sub-Saharan Africa

   Alternate hypothesis (Ha): External debt does affect economic growth in Sub-Saharan African.
2. Null hypothesis (Ho): Capital expenditure does not affect economic growth in Sub-Saharan Africa.

Alternate hypothesis (Ha): Capital expenditure does affect economic growth in Sub-Saharan Africa.

3. Null hypothesis (Ho): External debt and capital expenditure do not have joint effect on economic growth of Sub-Saharan Africa

   Alternate hypothesis (Ha): External debt and capital expenditure have joint effect on economic growth in Sub-Saharan Africa.

Significance of the Study

Governments in developing countries are significantly reliant on borrowing money from other countries to keep their economies running. Economic growth can be propelled by borrowing from outside the country. The lack of a strategy and cautious framework for managing debt may make borrowed funds unproductive in the receiving countries. Sub-Saharan Africa's failing economic situation has been compounded by debate about whether foreign debt has led to macroeconomic instability.

The findings of this research will be useful in formulating guidelines for the prudent use of debt. If the receiving countries do not have a system in place to manage their debt strategically and prudently, borrowing from other countries could actually work against them. External debt servicing has worsened the poor economic situation in Sub-Saharan Africa by contributing to macroeconomic instability.

Debt and economic development have been studied extensively, but this study presents a unique picture. A number of studies have found negative whereas others have identified a favourable association between foreign debt and economic development. This study will investigate further whether

external debt utilised for capital investment can help to achieve the necessary growth and development. This research will also aid in creation of economic policies regarding the use of external debt.

Additionally, it will help foreign creditors to better understand the debt and growth nexus. External borrowing is a major source of funding for government project. Governments use borrowing as a major source of financing budgetary support has been external loans (Suma, 2007). If the receiving countries do not have a system in place to manage their debt strategically and prudently, borrowing from other countries could actually work against them. Even while external debt has taken up a large portion of Sub-Sahara Africa's governmental debt, there is an ongoing dispute that it has exacerbated economic instability and contributed to the worsening of the region's economic predicament.

This study gives concise and unique linkages between debt and expenditure on growth. Empirical research provides light on the subject of whether the use of external debt for capital expenditures will increase national output.

Again, this study contributes to knowledge and economic policies relating foreign debt consumption. External debt stocks are linked to this exacerbated worsening position in SSA, which has taken up a considerable proportion of debt. Performing empirical research on Sub-Saharan Africa, this study will investigate further whether external debt utilised for capital investment can help to achieve the necessary national output. This research will also aid in the establishment of economic policies regarding external debt consumption.

Scope of the Study

The study focused on the effects of external debt and expenditure on growth and development in SSA. A panel of 37 SSA nations were studied for a period of 21 years (2000-2020). Hence, the research was not able to cover them all. Data was extracted from the World Development Indicators.

Limitations of the Study

The limitations were largely due to certain resources constraint such as unavailability of data for some countries in SSA. This constraint therefore limited the selection of countries, bringing the number of countries selected to 37 SSA countries are selected for a period of 21 years (2000–2020).

Delimitation of the Study

The following methodological approach and design used in the studies help to overcome the data constraint issues. The system GMM instruments as a panel data tool of estimation in itself has an inbuilt mechanism to provide consistent and unbiased estimates.

Organisation of Study

Chapter One contains the study background, problem statement, purpose, objectives, hypotheses, significance, scope, limitations and delimitations of the study.

Chapter Two contains the review of literature. The chapter also includes the definitions and meanings of the key terms.

Chapter Three discusses the study methods/techniques and design, sources of data and tools for the analysis of data. The explanations of the

selected variables and measurements of the variables, empirical model specifications and pre-estimation and diagnostic tests procedures.

Chapter Four contains the interpretations and discussions of results. These discussions were focused on the study goals and hypotheses.

Chapter Five, this entails summary, conclusions, and recommendations, as well as areas for further studies about the issues of external debt.

Summary

The chapter contains the introduction, the background to the study, the problem statement, the objectives of the study, the research hypotheses, the significance of the study the scope of the study and finally the organisation of the study.

The available literature showed that from the global, regional blocs and country specific levels, there is no unanimously agreed conclusion on the interrelationships among public debt, capital expenditure and economic growth. We sought to fill the research gap by investigating and using the dynamic panel GMM approach to find the external debt and economic growth nexus in the presence of capital expenditure in SSA.

CHAPTER TWO

LITERATURE REVIEW

Introduction

The chapter discusses on concepts, models of debt, capital expenditure and growth interrelationships. Debt, and growth are discussed in this chapter using data obtained from the internet and the insights of other experts. The study combined through relevant literature in the study focus areas, such as public debt, capital spending, and economic growth, as well as theoretical and empirical materials that were readily accessible.

Theoretical Literature Review

Solow-Growth Model

A contributory theory to growth is Solow model of 1956. Solow model sought to explain one of economics' great riddles; why are affluent nations so rich and poor ones so poor.

Solow model is based on assumptions below:

1. Only one homogenous good is produced and consumed
2. Technology in the short run is an exogenous factor.

Solow sets up a mathematical model which is consistent with the stylized facts of economic growth. Cobb-Douglas function supplied following aggregate production was used to build the model, which emphasizes long-term economic growth as:

$$\mathrm{Y} = \mathrm{F}(\mathrm{K}, \mathrm{L}) = K^{\alpha} L^{1-\alpha} \quad (1)$$

Where: Y is output, K is capital input, and L represents labour.

"α and $1-\alpha$ represent output elasticities of capital and labor respectively" and "α" "is a number between 0 and 1".

Intensive Form

The intense version of the equation may be obtained by manipulating the following equation in a mathematical way:

$$y = \frac{Y}{L} = \frac{F(K,L)}{L} = F\left(\frac{K}{L}, 1\right) := f\left(\frac{K}{L}\right) = f(k) \quad (2)$$

$$y = k^{\alpha} \quad (3)$$

The production function is expressed following the assumptions about population, saving, and technology with full employment of capital and labour. The corresponding growth rates are derived as follows:

output per labour, $y = \frac{Y}{L}$ (4)

capital per labour, $k = \frac{K}{L}$ (5)

and labour grows at a constant rate n: $\frac{1}{L}\frac{dL}{dt} = n$ (6)

Accordingly, a nation that employs more capital per worker would create higher production (Charles, 2002).

$$\acute{K} = sY - dK \quad (7)$$

Where;

$\acute{K}$ = change in capital, sY = gross investment, dK = depreciation in production

Solow's capital accumulation equation in per worker terms may be derived by further mathematical manipulation of the formula.

$$\acute{k} = sy - (n + d)\,k \quad (8)$$

Investment per labour, depreciation per labour, and population growth all effect the change in capital per worker according to the equation in the preceding section. Only the change in capital per worker was positively correlated with investment per worker among these three factors.

Capital Deepening and Capital Widening

In the Solow model, capital accumulation may be broken down into two distinct components: capital deepening and capital expansion. Capital deepening, on the other hand, increases the quantity of money available to each worker. New employees need to be supplied with capital as the population expands and therefore capital spreading is a way to meet this need.

The Decomposition

$$K = \left(\frac{K}{L}\right) L = KL \tag{9}$$

Time-based decomposition:

$$\frac{dK}{dt} = L \frac{dK}{dt} + K \frac{dL}{dt} \tag{10}$$

Where the first term; $\frac{dK}{dt}$, is the capital accumulation which is the capital deepening,

$L \frac{dK}{dt}$ plus the capital widening, $K \frac{dL}{dt}$.

Following the Solow decomposition and its two main formulae for output and capital per worker, respectively. These are how the intense capital accumulation equation is constructed:

$$y = ka \tag{11}$$

and

$$\acute{k} = sy - (n + d)\, k \tag{12}$$

The production function is given by y = ka. The investment made per employee, denoted by the symbol sy, is the subject of the second equation. It is reduced by a factor of "s" in translation. Because of the increasing population, the capital stock K is increasing even if the change per worker is zero, indicating that only capital broadening is taking place.

The Steady State

Capital-worker change equals zero at this moment, when "sy" = (n + d) k and "sy" = investment rate (Charles, 2002).

It is possible to express the appropriate steady-state capital and output quantities per worker as follows:

$$k^* = (s/n + d)^{1/1-a} \quad (13)$$

$$y^* = (s/n + d)^{a/1-a} \quad (14)$$

where:

k^*= steady state quantity of capital per worker

y^*= steady state quantity of output per worker

Solow argues that nations with a larger saving and investment rate develop faster as they may collect a huge amount of capital per labour, and this will enable these countries to produce more production per person. Conversely, nations with high rates of population increase are likely to be less prosperous (Charles, 2002).

Theoretical Perspectives of External Debt and Economic Growth

Through the debt overhang concept, Sachs (1989) first presented debt laffer curve to explain economic growth. Economic growth and debt are not linearly linked, according to the theory. The idea assumes that optimum level of debt encourages development, and beyond that point, more debt incurred inhibits economic investment and growth.

Debt Laffer Curve is useful because it shows that when the outstanding debt rises over a particular threshold, projected payments start to diminish. As a result, governments that borrow to fund their budget deficits have more resources available for capital investment in order to meet their growth goals.

Debt overhang and servicing issues slow economic development when borrowing increases over a particular threshold. The buildup of foreign debt has been shown in the literature to have the following propositions and conclusions. The Debt Overhang Hypothesis is the first theory (DOH).

In context of the debt overhang idea, there are two different types: the narrow and the wide. The restricted form of the debt overhang hypothesis says that the debt overhang effect develops when the debt limits investment in the country's infrastructure and economy. This is because investors assume that the government will boost the tax revenue to pay back the debts. Investors would minimize their investments in order to avoid the larger future tax obligations imposed by the law (Krugman, 1988; Sachs, 1988; Anyanwu; 1994). Based on these data, it may be concluded that imposing taxes on interest on external debt diminishes disposable income and limits savings for taxpayers. Also, the rescheduling of debt repayment conditions and debt negotiation procedures hinder investment when they increase a certain amount of uncertainty (Claessens et al., 1996). In times of rising public debt, governments are forced to curtail both public expenditure and investment in growth-promoting sectors of the economy. Heavy debt indicates that short-term government revenues will have to be utilized to pay off the debt, restricting public investment in certain critical economic areas. To put it another way, it might have an impact on local investment. Since certain private investments are meant to supplement public investments, a drop in public investment would have an impact on private investment (Taylor, 1983).

The debt overhang idea has two forms: a limited and a wide one. The restricted form of the debt overhang theory stipulated that, its effect emerges

and hampers progress in the country's infrastructure and growth. This is because investors believe that tax revenue to finance debt would be raised by government. To avoid greater tax burdens, investment would be reduced (Krugman, 1988; Sachs, 1988; Anyanwu; 1994). Based on these data, it may be concluded that imposing taxes on interest on external debt diminishes disposable income and limits savings for taxpayers. To put it in another way, the rescheduling of debt repayment conditions and debt negotiation procedures hinder investment when they increase a certain amount of uncertainty in the business environment (Claessens et al., 1996). External debt is also seen to hinder growth via development of human capital. In times of rising public debt, governments are forced to curtail both public expenditure and investment in growth-promoting sectors of the economy. Heavy debt indicates that short-term government revenues will have to be utilised to pay off the debt, restricting public investment in certain critical economic areas. To put it in another way, it might have an impact on local investment. Since certain private investments are meant to supplement public investments, a drop in public investment would have an impact on private investment (Taylor, 1983).

Capital Expenditure and Economic Growth

The Harrod-Domar model shows that economic development is a function of capital and savings. “Using the incremental capital output ratio”, the model explains how to satisfy a set of growth targets. Capital shortage, according to Effendi (2001) is the only impediment to production. If development is held back by slower physical capital expansion, new investment may be less productive. The model goes on to demonstrate that the

incremental capital production ratio may be used to accomplish growth objectives for a given set of investments.

According to Effendi (2001) capital shortage is the only restraint on production. Slowed physical capital expansion may have an indirect influence on economic output by lowering the productivity of new investment (Serieux, 2001). The capital expenditure used excludes the non-interest recurrent expenditure, which is made up of personal emoluments, administration and services, subventions, transfers and subsidies (ISSER, 2015).. Hence the variable is also expected to increase growth. Interest payments on debt retard growth through revenues that can be used for development purposes are rather channelled to the payment of these interests on government borrowings.

Empirical Literature Review

External Debt and Growth

There are several empirical publications on linkages that exist between governmental debt and potential growth. In later 1980s and early parts of 1990s, a rising corpus of literature focusing on the empirical research of the debt–growth relationship arose.

To begin with, this empirical research concentrated on nations in Latin America, where a consensus had evolved about the adverse link between debt and development. Some evidence provided for African economies by the works of researchers such as Fosu, Iyoha, Pattillo et al. (2002) shows debt and growth relation. If public debt crosses a certain level, it is only negative to economic development, according to Reinhartand Rogoff (2010)and Eberhardt and Presbitero (2015) for developing nations. Notwithstanding the challenges in the Sub-region, the most developed economy is South Africa. The country

undertook major political and economic reforms since the 1990s. In this present research, there is an attempt to remedy the problems that have been discovered in the empirical analysis.

Some empirical works included Elbadawi et al. (1997) who found that debt level beyond the threshold of 97% have negative effect. Similarly, Imbs and Ranciere (2005) concluded that between 55% to 60% debt-to-GDP, the countries experiences debt overhang.

Debt has becomes a common distasteful experience in most economics. The situation is because of the undeveloped domestic sources of borrowing to which the government could source for a loan especially the local market could not support the long – term borrowing as a demand of most economies.

Using the investment experience of 13 highly indebted African nations, Deshpaned (1997) investigates the debt overhang theory. This cannot be explained by a standard duty; rather, it can only be explained by the real amount paid by the creditor and a debtor Country. Because of this, debtor nations were able to pay off their debts by increasing output and exporting their goods.

Fosu (1999) primary objective was to investigate the debt overhang concept in depth and in the open. Even if the amount of investment in the country is not affected. According to his findings, the model's debt variables had a negative coefficient from 1980 to 1990.

In the World Bank study report on classification of countries according to some defined income bracket, in a standardized currency measure of the US dollars. Middle-income nations had a gross domestic product of between

$1,026 and $12,475 in 2015. (World Bank, 2020). South Africa, Botswana, Equatorial Guinea and Mauritius were among the nations in the middle-income bracket. GDP per capita of at least $4,036 was achieved by these nations (World Bank, 2020).

In about two years ago there was a classification of countries by the World Bank, the classification had forty-eight (48) countries the world over being classified as Less Developed Countries (LDCs). Thirty-four (34) countries out of the forty-eight (48) were from the Africa continent. With more than eight hundred and eighty (880) million people and this represent twelfth (12) per cent of the global population. They accounted for approximately less than two (2) per cent of the global GDP and about one (1) per cent of the trade in goods (World, 2019).

Checherita-Westphal and Rother (2010) examined and found that debt-to-GDP ratios of 90-100%. Then ratios of 70% to 80% of GDP have been shown detrimental according to confidence intervals. Furthermore, Egert (2013) found that even modest amounts of debt have detrimental impact on development (between 20 percent and 60 percent of GDP).

Further research works on the interrelationships between public debt and capital expenditure are Appiah (2014) and Aigheyisi (2013) who both produced direct relationship that exist between capital investment and growth while that of Modebe *et al*. (2012) and Nasiru (2012) concluded on a negative relationship. As such this study also considers making a case about the expenditure and growth.

Expenditure and growth nexus models based on research by Musgrave (1969) and Rostow (1971) were in empirical studies about expenditure and

growth. According to these models, public sector investment is at its highest phase growth. Social and economic infrastructures, such as roads and power, are provided by the public sector. These expenditures on infrastructure are critical if we are to propel the economy into its next stage of growth and maturity. Many infrastructure costs have huge external advantages or need big capital expenditures with returns spread over a long period of time, making them difficult for private providers to take advantage of. There will be a shift in spending from infrastructure to education, health, and social services as the economy achieves its maturity. To put it another way, the economy is shifting more from capital to recurring spending. Public spending on income maintenance and welfare programs will rise considerably during a time of high mass consumption compared to the whole (Mthethwa, 1998). As per capita income rises, the transfer spending grows. Whether or not this causes an increase in income disparity is up for debate. According to Musgrave & Peggy (1984), technical and demographic developments might contribute to public spending increase. Externally beneficial things that the government can supply may have their relative significance shift due to technological advancement. When population growth or age distribution changes occur in a population, this may be seen in the amount spent on health, education, and welfare services.

Having considered the theoretical hub of expenditure and growth, other the empirical studies by Josaphat et al. (2000) adapted Ram (1986) proposed a disaggregation of government spending into capital, consumer expenditures, and the investment in human capital. These authors' results indicated a positive share of capital spending and reverse holds.

Dauda (2010) used data from 1977 to 2007 found that education spending favourably impacted development. There is a substantial correlation between government income and the one-year delay in spending decisions. Government spending fell short of expectations in terms of stimulating economic development. There was no evidence of a negative or negative feedback impact on pricing induced by granger's law, according to their findings. While prices greatly affected real GDP, spending had a positive and large impact on the economy's growth.

Under extreme situations like war or natural catastrophes, early classical economics believed that government intervention in the economy may be acceptable because it would shift resources from the private sector into useless activity (Tsoulfidis, 2007). Because of their perceived lack of relevance to the present economy, these previous ideas were not given much consideration in the economics paradigm. According to Keynesian economics, deficits of budgets have "crowding in" and "expansionary" effects.

Krugman (1988) stated in his work that excessive debt reflects future tax on production and a disincentive to savings and investment. Which explains the change in international debt management.

According to Hoffman and Reisen (1991) limited investment in high-debt third-world nations may be attributed to liquidity limitations rather than debt overhang. This is especially true since they claim that a binding liquidity limitation on debt would limit the amount of cash available for investment (Fosu, 1999).

The Ricardian-equivalence thesis on debt financed tax-cut was re-energized by Barro (1989) who proposed that government debt has no impact

on economic development since it is repaid by future taxes, which encourages increase savings. The upshot is that the aggregate demand macroeconomic indicators remained unaffected, but they would not have been if the government had decided to raise taxes now rather than later (Mosikari and Eita, 2017).

Over the years, countries in SSA faced difficult economic times with huge public debt. From the 1960s through to 2000 these countries were in economic crisis and had increased their debt stocks. However, the era of the debt reliefs, that is the Highly Indebted poor countries in 2000, where most of these countries benefited from debt reliefs and huge debts were forgiven and some development supports were directed to many of the beneficiary countries.

Following the worldwide economic slump, several of these nations were in financial difficulties again between the HIPC period until sometime around 2008. SSA nations are still saddled with enormous public debts. Even in SSA debt to GDP ratio increased from 37% to 57% in 2012 and 2017 respectively (World Bank, 2018). In addition, the number of nations in SSA being financially distressed quadrupled in less than a decade, from 8 to 18 countries in 2013 and 2018 respectively (IMF, 2018).

According to the African Development Bank (2018) infrastructure finance needs range from $68 billion to $108 billion. Africa's governments need to be reminded of the long-term negative implications of excessive indebtedness. High debt levels impair long-term growth through increasing interest rate payments, increasing future taxes, and generally affect policies (Godwin, 2012).

Capital Expenditure and Growth

The nature of spending impacted on growth inconclusively. Some authors such as Laudau (1985), Folster and Henrekson (2001), Ekpo (2005) submitted the negative but insignificant influence of capital investment and economic growth, while other authors like Donald and Shuaglin(1993), Niloy, et al (2003), Ranjan and Sharma (2008), Muritala and Taiwo (2011) and so on, found that government capital spending significantly and positively influence economic growth. Another view maintained neutral ground on this issue and conclude that government capital expenditure does not exert any impact on economic growth (Gupta et al, 2002).

In the study, public expenditure on education and health represented human capital development while infrastructure development was represented by public expenditure on roads and waterways. Using a Keynesian aggregate output accounting framework in an open economy the study modelled the relationship between government spending and economic growth into a two-sector production function.

However, expenditure on health and infrastructure promotes economic growth while that of education has no significant impact on economic growth in the short run. Political variables such as the nature of democracy and political instability all proved significant in promoting economic growth in Ghana.

Appiah (2014) also studied the relationship between spending and national output of Ghana and further took into consideration a disaggregated government expenditure analysis. Using maximum likelihood estimation and an ARDL model, it concluded that government expenditure on the whole

negatively affects economic growth but within the expenditure, capital expenditure was found to promote growth while the recurrent expenditure retards economic growth in Ghana. Most of such studies did not focus on the sub-components which could account for their performance.

Anning *et al*. (2016) "the impact of government debt and economic growthin Ghana, using a time series data from 1980 to 2015, it employed an Autoregressive Distributed lag (ARDL) bounds testing approach to co-integration and Vector Error Correction Model (VECM)" as the estimation. Using the Granger causality test, it also concluded on a causal independence between government spending and economic growth.

In a similar study in Kenya, the "impact of public expenditure composition on economic growth" from 1964 to 2011 was carried out by Muthui *et al*. (2013) using a Vector Error Correction model. The study used a three-variable multiple regression model. Moreover, researchers looked at the link between capital and operating government spending and economic development. Adopted was a three-variable multiple regression model. According to the study, in a growing economy, government spending can be re-directed to the business sector and the efficiency of the private sector in the Nigerian economy could support businesses to thrive.

In a similar study in Kenya, the impact of public expenditure composition on economic growth from 1964 to 2011 was carried out by Muthui *et al*.(2013) using a Vector Error Correction model. The study concluded that though government expenditure on education positively influence economic growth, it does not trigger any significant change in growth.

Furthermore, the need for private sector investment was also re-echoed in a recent empirical literature in Nigeria by Modebe *et al*. (2012). The study categorised government expenditure into capital and recurrent expenditure and estimated their relationship with economic growth from 1987 to 2010.

Summary

Theoretical literature relevant to this study includes the Solow Growth Model. The chapter again provided details of empirical literature relevant to the study. Earlier studies reviewed indicate varied relationships and effect between external debts, capital expenditure on economic growth.

However, previous studies could not examine the interactive effect of external debt and capital expenditure on economic growth in Sub-Sharan Africa. Additionally, the joint effect of external debt and capital expenditure will be carried out with particular emphasis on the effects of these variables in Sub-Saharan Africa.

CHAPTER THREE

RESEARCH METHODS

Introduction

Chapter three contains study design, data sources and tools for analysis, variables and estimation techniques in studying the transmission mechanism between external public debts and 37 chosen Sub-Saharan African countries' capital expenditures on economic development.

Research Design

The design represents a complete process, from envisioning an issue through the literature review, research questions, techniques, and findings. The research adopted the quantitative research approach. The dynamic panel estimation techniques were implored.

Model Specification

The neo-classical growth model of 1956 by economist Robert Solow was adopted. According to Solow's formulation, the sum of economic activities in an economy in addition to capital accumulation, technological progress plus labour.

$$Y_t = f(K, L) \qquad (15)$$

The production function for the purposes of this study follows the Cobb-Douglas functional form.

$$Y_t = F(K, L) = A_t K_t^{\alpha} L_t^{1-\alpha} \qquad <0 < \alpha < 1 \qquad (16)$$

Where, Y_t represents output of the economy (GDP) overtime, K_t is capital input overtime,$L_t$is labour input overtime and A_t is technological progress.

The expression of the growth rate, thus the changes over time in the outputs and inputs. The growth rates series are the derivatives with respect to time of the production function are expressed as:

$$\dot{Y}_t = \frac{dY_t}{dt} \quad (17)$$

$$\dot{K}_t = Y_t - C_t - \delta K_t \quad (18)$$

$$\dot{L}_t = \frac{\dot{L}_t}{L_t} = n \quad (19)$$

$$\dot{A}_t = \frac{\dot{A}_t}{A_t} = g \quad (20)$$

using logarithms of series.

$$Log\,(XY) = logX + logY \quad (21)$$

$$Log\,(XY) = YlogX \quad (22)$$

Therefore, the growth of output is:

$$logYt = log\,(A_t K_t^{\alpha} L_t^{1-\alpha}) \quad (23)$$

$$= log\,(At) + log\,(K_t^{\alpha}) + log\,(L_t^{1-\alpha}) \quad (24)$$

$$= log\,(At) + \alpha\, log\,(K_t) + (1-\alpha)\, log\,(L_t) \quad (25)$$

Taking the derivatives with respect to time:

$$\frac{\dot{Y}t}{Yt} = \frac{\dot{A}t}{At} + \alpha\frac{\dot{K}_t}{K_t} + (1-\alpha)\frac{\dot{L}_t}{L_t} \quad (26)$$

$$\frac{\dot{Y}t}{Yt} = g + \alpha\frac{\dot{K}_t}{K_t} + (1-\alpha)n \quad (27)$$

$$\dot{K}_t = sY_t - \delta K_t \quad (28)$$

The growth of Capital stock

$$\frac{\dot{K}_t}{K_t} = s\frac{Yt}{K_t} - \delta \quad (29)$$

Steady state growth rate

$$\frac{\dot{Y}t}{Yt} = \frac{g}{1-\alpha} + n \quad (30)$$

Capital-Output ratio using logarithms

Let, $X_t = \frac{K_t}{Y_t}$ (31)

From, $\frac{\dot{K}_t}{K_t} = s\frac{Yt}{K_t} - \delta$ (32)

$logXt = log\frac{Kt}{Y_t} = logKt + log\frac{1}{Y_t} = logKt + logY_t^{-1} =$

$logKt - logYt$ (33)

$\frac{\dot{X}_t}{X_t} = \frac{\dot{K}_t}{K_t} - \frac{\dot{Y}t}{Yt}$ (34)

Integrating the growth of production and capital growth to determine the dynamics of capital -output ratio:

$\frac{\dot{X}_t}{X_t} = (1 - \alpha)\frac{\dot{K}_t}{K_t} - g - ((1 - \alpha)n$ (35)

$= (1 - \alpha)(\frac{s}{X_t} - \frac{g}{1-\alpha} - n - \delta)$ (36)

The Capital – output ratio exhibits convergence dynamics, thus $\frac{\dot{X}_t}{X_t} = 0$

This implies that in each period the capital-output ratio is thus:

$(1 - \alpha)(\frac{g}{1-\alpha} + n + \delta)$, the gap between the current value of the ratio and its steady-state value.

The Steady-State level of output per labour:

$\frac{Y_t}{L_t} = A_t^{\frac{1}{1-\alpha}} X_t^{\frac{\alpha}{1-\alpha}}$ (37)

Changes in technological progress or the capital-output ratio are assumed to explain all changes in output per worker's output. Because A_t is anticipated to develop at a consistent pace each time.

Taking the logs-and-derivatives from the above equation to get the growth rate of output per worker in terms of technological progress and changes in the capital-output ratio:

$\frac{\dot{Y}_t}{Y_t} - \frac{\dot{L}_t}{L_t} = \frac{1}{1-\alpha}\frac{\dot{A}t}{At} + \frac{\alpha}{1-\alpha}\frac{\dot{X}_t}{X_t}$ (38)

$$\frac{\dot{Y}_t}{Y_t} - \frac{\dot{L}_t}{L_t} = \frac{\alpha}{1-\alpha} + \alpha\left(\frac{g}{1-\alpha} + n + \delta\right)\left(\frac{X^* - X_t}{X_t}\right) \quad (39)$$

"Output growth equals the steady-state growth rate $\frac{g}{1-\alpha}$ plus or minus that element due to the capital-output ratio converging towards its steady-state level".

"The model also gives us an expression for the steady-state path for output per worker, that is the path towards which output is always converging in which"$X_t = X^*$.

Empirical Model Specification

The research employed Fosu (1996), enhanced output function. which represents output. The increased production function is stated as:

$$Y_{it} = \beta_1 + \beta_2 L_{it} + \beta_3 K_{it} + \beta_4 X_{it} + e_i \quad (40)$$

Dynamic Panel-Data Model

The introduction of a dynamic model is to account for the serial correlation and limit chances of obtaining misleading results.

The dynamic model is generally specified below:

$$Y_{it} = \beta_1 + \beta_2 Y_{it-1} + \beta_3 L_{it} + \beta_4 K_{it} + \beta_5 X_{it} + \mu_i + v_{it} \quad (41)$$

$$\log Y_{it} = \beta_1 + \beta_2 \log Y_{it-1} + \beta_3 \log L_{it} + \beta_4 \log K_{it} + \beta_5 \log X_{it} + \mu_i + v_{it} \quad (42)$$

Y_{it} is output, $Y_{it-1}$is lagged dependent variable, X represents the matrix of all independent variables, $\mu_i$denotes unobserved country-specific time-invariant effect, v_{it}represents the stochastic error term, $\beta_1, \beta_2$and β_3= are vectors of parameters to be estimated, i indexes the countries under study and t denotes time (or year).

The variables Y, L, and K, are output, labour, and capital stock respectively. The dependent variable (Y) indicates the annual growth rate of realGDPpc. Explanatory variables are external debt, and capital expenditure

are used. However, I n the dynamic model, labour and capital are specifically represented as X_{it} independent variables which are used in the study as controls.

Estimation Method

The estimation of the model was done using the GMM estimation technique. The "GMM" estimation technique preferred among all other dynamic model estimators (Roodman, 2006).

RGDPpc = f(External debt, capital expenditure, interaction between external Debt and capital expenditure growth, lagged of RGDPpc, labour force, gross capital formation, and other control variables).

$$\ln RGDPpc_{it} = \beta_1. + \lambda \ln RGDPpc_{it-1} + \beta_2 \ln EXD_{it} + \beta_3 \ln CAPEX_{it} + \beta_4 \ln(EXD * CAPEX)_{it} + \beta_5 \ln Capital_{it} + \beta_6 \ln Labour_{it} + \beta_7 \ln FDI_{it} + \beta_8 \ln ExRate_{it} + \varepsilon_{it} \quad (43)$$

where;

$RGDPpc_{it} = Real$ Gross Domestic Product per capita

$RGDPpc_{t-1_{it}} = lag\ of\ Real$ Gross Domestic Product per capita

$\ln EXDgr =$ Log of external debt growth rate

$\ln CapExpgr =$ Log of Capital expenditure growth rate

$\ln Capital =$ Log of Gross capital formation

$\ln Labour =$ Log of Labour force total

$\ln FDI =$ Log of Foreign Direct Investment, inflows

$\ln(ExDgr * CapExpgr) =$ Log of Interaction term

$\boldsymbol{\varepsilon_{it}} =$ Error term

Extended Dynamic Panel-Data GMM Model Estimation

According to Blundell and Bond, the additional instruments used in the extended GMM estimator are not rejected in this application, and they confirmed that the lagged first-differences are informative instruments for the endogenous variables in levels and excluded the unobserved cross-country differences.

$$\log Y_{it} = \beta_1 + \beta_2 \log L_{it} + \beta_3 \log K_{it} + \beta_4 \log X_{it} + \mu_i + v_{it} \quad (44)$$

The model is specified as:

$$\ln RGDPpc_{it} = \beta_1 + \beta_2 \ln EXD_{it} + \beta_3 \ln CAPEX_{it} + \beta_4 \ln(ExD * CapExp)_{it} + \beta_5 \ln Capital_{it} + \beta_6 \ln Labour_{it} + \beta_7 \ln FDI_{it} + \beta_8 \ln ExRate_{it} + \varepsilon_{it} \quad (45)$$

where:

$RGDPpc_{it}$ = Real Gross Domestic Product per capita

$\ln EXDgr$ = Log of External debt growth rate

$\ln CapExpgr$ = Log of capital expenditure growth

$\ln Capital$ = $Log\ of$ Gross Capital Formation

$\ln Labour$ = Log of Labour Force total

$\ln FDI$ = Log of Foreign Direct Investment, inflows

$\ln(ExDBTot * CapExp)$ = Log of Interaction term

$\boldsymbol{\varepsilon_{it}}$ = Error term

Data Type and Sources

The research uses the panel data set derived from the World Development Indicators (WDI, 2020). The panel data set includes the variables of the research which are External Debt Total (ExD), capital expenditure growth (CapExp), and the interaction between external debt and capital expenditure (ExD*CapEx) and some control variables for 37 selected

SSA nations (refer to appendix). The study used the STATA 15 software package as a statistical tool for pre-estimation tests, empirical model estimations and post-estimation tests.

Model Diagnostic Tests

Pre-estimation and post-estimation tests generally ensure that the model produce unbiased results.Test such as Fisher-type unit-root test and which include serial correlation test, heteroscedasticity test, multicollinearity and endogeneity

Fishers-Type Unit-Root Test

The Fisher-type unit-root test is to determine if a panel regression model is stationary and the Levin and Lin (LL) Test (1992) is estimated.

Autocorrelation

Autocorrelation among some variables may be possible in the model. Since the "dependent variable is a function of a component of the error term", then the lagged of it is a function of the error term."Thus, $q_{it} = f(ui)$ and $q_{it-1} = f(ui)$, this indicates that the lagged dependent variable is correlated with the error term".

This is called autocorrelation. It is therefore possible to prove that,

$$\text{Cov}\left(u_i, u_j\right) \neq 0, \text{for } i \neq j.$$

Heteroscedasticity

This econometric problem occurs anytime the variance of the unobservable termkeep changing and becomes a function of the right-hand side variables as described below:

$$\text{Var}(u_{it}/X_{it}) = \sigma^2 h(X_i) \quad (46)$$

In panel regression analysis the assumption of Ordinary Least Square (OLS) being homoscedastic (constancy of variance of the error term) is defeated.

Endogeneity

A multiple regression issue known as endogeneity can occur in the model. An endogeneity issue develops when one or more of the variables in the regression model has a statistical link with an error term in the model.

The bias in the regression model excludes a key variable, measurement or coding errors of the independent variables, and lastly, Simultaneity in the model; when two or more explanatory variables jointly determined the dependent variable or the two-way causality relationships between the endogenous and external variables in a model.

If endogeneity exists or does not, the residuals will be subjected to the Durbin-Wu-Hausman test in order to determine which estimate method should be used. The Durbin-Wu-Hausman help to checks whether there exists endogeneity in the residuals, and then for the use of a proper estimation approach that address the issue of endogeneity appropriately.

Over Identification

No GMM estimator can be impartial and efficient without the use of valid instruments, "Arellano and Bond (1991), and Blundell and Bond (1998)". The assumption that the variables are exogenous and that they have no relationship to the model's error term must hold.

Arellano-Bond Test for Serial Correlation

Using this test, the assumption of serial correlation of the initial difference regression errors are examined. It is possible to do the Arellano –

Bond, AR (1) and AR (2) tests using the conventional coefficient covariance matrices.

Fixed Effects Model

The fixed effects regression is used in panel data estimation and analysis to correct for omitted variables in the nations, but they do not vary over time in the estimation process. There are separate intercepts in the fixed effect for each nation so that it the potential for absorption country-specific and time invariant impacts of any neglected variables. Due to unobserved country and temporal variations, endogeneity issues and bias coefficients arise. After eliminating the average effect on a certain nation from each variable, a regression is constructed using the entity demeaned variables to solve this issue.

The following fixed effects regression model would be produced by the country-specific and time-invariant variables:

$$Y_{it} = \beta_1 X_{it} + \alpha_i + \mu_{it} \quad (47)$$

$$\alpha_1 = \beta_0 + \beta_2 Z_i \quad (48)$$

where:

Z_i = "unobserved country-specific time invariant variable",α = "the entity fixed effects and variations from the omitted variables"Z_i.

Using fixed effects regression model, the following is the average of the country-specific effects:

$$\hat{Y}_{it} = \beta_1 \hat{X}_{it} + \hat{\mu}_{it} \quad (49)$$

In a fixed effects regression model, the country-demeaned variables, $\hat{Y}_{it}$ and $\hat{X}_{it}$ are utilized. The country specific effects are eliminated and the error term, $\hat{\mu}_{it}$remained the same over time.

Random Effects Model

In general, the random effects regression model assumes that there is no association between the independent variables and any unobserved country-specific time invariant effects.

$$\text{Cov}\ (\mu_{it}, X_{it}) = 0 \qquad (50)$$

Hausman Test

This test connects model-independent variables to each other (Hausmann, 1978). Test statistics are generated by computing the chi-squared with degrees of freedom. Individual impacts on other independent variables contradict the Gauss Markov assumption, hence the random effect model is no longer the best linear unbiased estimate when it is used (BLUE). Individual impacts are thus a component of RE's error term, according to this conclusion. As a result, if the Ho is rejected, the FE model would be given preference over the RE model. Even if the individual effects are part of the intercept, they do not break any of Gauss-assumptions Markov's in this model, hence the model is still blue.

A Priori Expected Signs of the Study Variables

According to literature assessed, the variables employed in the research and their a priori predicted coefficients in the estimated models.

Explanation of variables used in the study

Explanation of variables is necessary before beginning an empirical inquiry into how the factors of interest affect real GPD per capita in SSA. The description and measurement of these variables are outlined below:

Table 2: Variable Description and A Priori Signs

Variable	Description	Coefficient Sign
lnRealGDPpc	Natural log of RealGDPpc	-
lnRealGDPpct-1	Natural log of lagged RealGDPpc	Positive (+)
lnExDebt	Natural log of External Debt Total	Negative(-)
CapExp%GDP	Capital Expenditure percentage of GDP	Positive (+)
CapitalFormation% of GDP	Gross Capital Formation percent of GDP	Negative (-)
lnLabourForce	Natural log Labour Force Total	Positive (+)
lnOfficialExRate	Natural log of Official Exchange Rate	Negative (-)
FDInetinflows%GDP	Foreign Direct Investment net inflows percentage of GDP	Positive (+)
ln(ExD*CapExp)	Natural log of the interaction term	Positive (+)

Source: Loggu-Naa(2022).

Dependent Variable

Economic Growth

Economic growth is the long-term rise in overall production that is considered to be beneficial (Lipsey, 1956). This study adopted RealGDPpc as a measure economic growth. It includes both private and public consumption, private and public investment, and exports less imports. RealGDPpc is used in the study as the dependent variable, set to be explained by the explanatory variables considered in the specification. This study used the log of RealGDPpc as a transformation of the RealGDPpc current values. The log transformed values of RealGDPpc would ensure a normal distribution of the data for consistent

and unbiased estimation. Ayadi and Ayadi (2008), Sichula (2012) as well as Akram (2013) all found the same results.

Independent Variables

External Debt

External debt is a component of public debt which is referred to as government debt which represents the total outstanding debt (bonds and other securities). Public debt is incurred both externally and internally. External debt is the debt owed to lenders outside the country and internal debt represents the government's obligations to domestic lenders. The entire amount owing to non-residents of a nation and repayable in foreign money, products, or servicesis known as external and domestic debt.

This research work seeks to measure the effect of external debt as an explanatory variable andto further show the effects of using external borrowings to invest in capital expenditure and the potential influence it would bring on economic growth. The total external debt values obtained from the dataset of the World Development indicators (2000-2020) were transformed into their log values to ensure that the data is normally distributed to produce consistent and unbiased results for the empirical estimations and analysis. There have been a number of previous studies on the relationship between foreign debt and economic development, including Reinhart, Rogoff, Savastano, and Presbitero (2011). These studies proposed a non-linear relationship between debt and economic growth. However, this study empirically is to investigate the effects of the external debt stock on economic growth and also to show that externally borrowed funds when invested into capital expenditure would positively influence economic growth.

Capital Expenditure as a Percentage of GDP

Capital expenditure is explained as the part of government spending that goes into the creation of assets like schools, colleges, hospitals, roads, bridges, dams, railway lines, airports and seaports. Capital expenditure also includes investment by the government that yields profits or dividend in future. All these researchers found a direct relation between capital expenditure and economic growth and concluded that their capital expenditure has a positive influence economic growth (Pattilo, 2002).

Gross Capital Formation as a Percentage of GDP

This consists of outlays in addition to fixed assets of the economy plus net changes in the level of inventories. Net investment and replacement investment are included in gross capital formation to maintain the current level of capital (Froyen, 2009). Both the public and private sectors of the economy make investments. As an explanatory variable, capital formation as a proportion of GDP is used for the study of how GDP growth affects gross capital formation. This follows the Solow model use of capital and in the Cobb-Douglas functional form. The values of gross capital formation were obtained from the WDI dataset of 2020. Capital formation has been cited in the works of (Pattilo, Poirson, and Ricce, 2002; Investment directly impacts on economic activity, which in turn affects output (Fosu,1999).The study obtained the data on gross capital formation from the WDI dataset 2020.

Labour Force Total

Labour force includes persons aged fifteen and older persons who actively participate in the production of goods and services in the country during a specific time (WDI, 2020). The definition of labour force includes

people who are currently employed and people who are unemployed but seeking work as well as first-time job-seekers. Iyoha (1999), defined labour force as the number people ages 15 and above who meet ILO definition of economically active population. According to the World Bank and the ILO, "the labour force data are harmonized to ensure comparability across countries and over time by counting the differences in data source, scope of coverage, methodology, and other country-specific factors". The natural log of the labour force total is used in this study as an independent variable. The natural log transformation of labour force total is expected to be normally distributed and suitable for the empirical estimations. The labour force total values were obtained from WDI dataset 2020 publication.

Foreign Direct Investment Net Inflows as a Percentage of GDP

The term refers to all investment from enterprises operating in an economy other than that of the investor. Again, it is the sum of equity capital, long-term capital, and short-term capital and re-investment of earnings usually recorded on the balance of payments. The converted figures of foreign direct investment net inflows as a proportion of GDP are utilized in this research. The data for foreign direct investment net inflows are obtained from the WDI dataset, (WDI, 2020).

Official Exchange Rate

The official exchange rate is established by national authorities or to the rate decided in the legally sanctioned exchange market. It is determined as a yearly average based on monthly averages; hence, local currency units relative to the U.S. dollar (WDI, 2020).The natural logs values of the official exchange rate figures are used in this study. This transformation of the values makes the

data to approach a normal distribution in order to obtain robust and unbiased results from the estimations.

DynamicGMM Model Estimation Techniques

Despite the advantages of the dynamic panel-data one-step difference GMM estimation model, Blundell and Bond (1998) proposed the extended restricted model estimation in other to ensure that the instruments are less or equal to the groups to ensure that robust results are obtained. The Hansen and Sargan test for over identification of instruments is used.

Summary

The chapter contains the methods, design, and data sources. The theoretical and empirical models were specified. The estimation techniques (fixed effects, random effects, Arellano-bond dynamic estimation techniques) were used and the Hausman post estimation test.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

Chapter Four contains impact results and discussions. The chapter also contains variables, diagnostics and pre-estimation tests, results of the models' estimations, and ultimately, an explanation of the findings and a conclusion.

Descriptive Statistics

Table 3 contains the summary statistics for analysis of data which is essential as it offers information on statistical measures.

For better comprehension and appreciation of the interpretations of the statistics displayed in the summary table, there is the need to briefly explain the statistical measures and normality as presented in the summary table.

The mean represents value of the study variables measured as average. The median is the middle value after sorting the observations. The range is the difference between the highest and lowest value in the series. The standard deviation values show how far data points are from the sample mean. Positive skewness means that the data has more higher values.

A normal distribution has a kurtosis value of 3 and referred to as mesokurtic. A positive kurtosis implies that the data has more higher values above the sample average and therefore has a peaked-curve (leptokurtic). Again, a negative kurtosis implies that the data has more lower values below the sample average and therefore has flatted curve (platykurtic).

Summary Statistics Interpretation

The real per capita GDP for the 37 selected countries in SSA averaged1695.113 US dollars for the period of the study, 2000 – 2020. The

minimum value of 113.5673US dollars and the maximum of 11208.34 US dollars represent the range between the lowest real per capita GDP and the highest real per capita GDP in SSA for the study period. The deviation of 2089.407US dollars shows how far the observations on real per capita GDP are from the average value of real per capita GDP. The real per capita GDP has a skewedness value of 2.312815which means that the

Table 3: Summary Statistics

Variable	Mean	Minimum	Maximum	Std. Dev	Skewness	Kurtosis	Jarque-Bera	Prob	Obs
RealGDPpc	1695.113	113.567	11208.340	2089.407	2.313	8.039	848.139	0.000	777
ExDebt	9.380	1.318	1.851	2.011	2.313	39.687	1863.512	0.000	777
CapExp%GDP	93.775	46.130	193.266	13.509	-0.224	8.022	13724.076	0.000	741
CapitalForm%GDP	21.426	1.097	81.021	9.036	1.476	8.610	12629.351	0.000	752
LabourForce	7574108	127464	6.321	9698287	2.916	13.609	4702.232	0.000	777
OfficialExRate	602.253	0.044	6658.031	858.706	3.174	15.958	4337.402	0.000	507
FDInetinflows%GDP	3.729	-11.199	46.275	5.443	3.481	20.040	6452.652	0.000	740

Source: Loggu-Naa (2022).

Real gross domestic product per capita is positively skewed, and has a long right tail, this implies that there are more higher values above the average value in SSA. The value of the kurtosis, 8.040 indicates that the real gross domestic product per capita is leptokurtic (peaked-curve), which also affirmed that there are more higher values above the average. The Jarque-Bera test statistic is 848.140 and the probability is not statistically significant.

The external debt total for the SSA countries for the study period averaged 9,380,000,00 US dollars. The external debt total ranges from a lowest value of 131,000,000 US dollars to a highest value of 185,000,000,000 US dollars. The standard deviation of20,100,000,000, implies that the external debt of the countries are20,100,000,000 US dollars far from the average value. The external debt has a positive skewness value of 2.313. Also, the kurtosis of 39.687is a leptokurtic (peaked-curve), this suggest that there are more higher values above the average. The Jarque-Bera test statistics has a zero probability. Since the probability value is less than 0.05. Hence, external debt data is not normally distributed in SSA countries.

The capital expenditure for the selected countries in SSA averaged28,300,000,000 US dollars for the period of the study. Capital expenditure ranges from a lowest amount of 371,000,000 US dollars to a highest amount of 479,000,000,000 US dollars. The standard deviation of 67,200,000,000 US dollar, which indicates how far capital expenditure in SSA countries is from the average amount. The skewness of 4.320shows a skewness which represents a right tail distribution. Additionally, the value of the kurtosis of 22.341 is a leptokurtic distribution (because 9.001> 3), this

implies that the data has a peaked curved and there are more higher values than the average value. The Jarque-Bera value of 13724.075.

The gross capital formation for the selected countries in SSA averaged 6,930,000,000 US dollars for the study, thus from 2000 – 2020for the overall observations. The gross capital formation ranges from the lowest amount of 6974332 US dollars to a highest amount of 127,000,000,000 US dollars. The standard deviation of 14,800,000,000 US dollars shows how the observations are far from the average value. The positive Skewness of 4.049value depicts that the distribution is too peaked and has a long right tail, indicating that there are higher values above the average value. The value of the kurtosis 21.473. Gross capital formation has positive kurtosis and is leptokurtic. This implies that there are higher values in the distribution that are above the mean.

The labour force for the selected countries in SSA averaged 7,574,108 people (economically active population of aged 15 and above) for the study period. The labour force numbers range from a lowest number of 127,464 people to a highest number of 63,200,000 people. The observations have a standard deviation of9,698,287from the average number of labour force. The positive Skewness of 2.916 shows a long right tail, this means that there are more higher values above the average.The value of the kurtosis is 13.609, this value represents a leptokurtic distribution which means that there are more higher values above the average. The Jarque-Bera test statistic is 4702.232and its probability value is 0.000, since it is less than 0.05, the null hypothesis of a normal distribution is rejected.

The official exchange rate for the selected countries in SSA averaged602.253 local current units (LCU) to 1 US dollars. The exchange rate

ranges from a lowest value of 0.044 US dollars to a highest value of 6658.031 US dollars in SSA. The observations vary from the average by 864.488 US dollars. The positive Skewness value of 3.173 depicts a long right tail, which shows that there are higher values of exchange rate that are above the average. The value of the kurtosis is also positive, 15.958 and greater than normality level of 3 (mesokurtic). The value describes a leptokurtic distribution and follows that there are higher values that are above the average. The Jarque-Bera test statistics of 4337.402 has a probability of 0.000 which is less than 0.05 statistical significance level.

Additionally, foreign direct investment net inflows for the selected countries in SSA averaged678,000,000 US dollars. Foreign direct investment inflows in SSA ranges from a lowest of -7,400,000,000US dollars to higher amount of 10,000,000,000 US dollars. The overall observations for foreign direct investment inflows have a standard deviation of 1,470,000,000 US dollars from the average amount of foreign direct investment inflows. The positive Skewness of 2.220 has a long right tail distribution and this means that there are more higher values above the average. The positive value of the kurtosis of 16.840 indicts a leptokurtic distribution. This means that there are higher values of foreign direct investment inflows above the average.

From the Table 3, the raw data observations for all variables are not regularly distributed. Real gross domestic product per capita external debt total, labor force, and the official exchange rate were all transformed using the natural log transformation of real gross domestic product per capita. The normal distribution of the modified variables' values was employed in the study's estimates and outcomes analysis (presented in Appendix C).

Diagnostics Tests Results

Correlation Matrix

The correlation matrix measures the extent of linear association between the variables of the study. It is used to explain the extent of substitutability among the variables in a model. The correlation test is important test because it avoids the possibility of the problem of multicollinearity and biased estimates.

Table 4 below shows the results of the correlation matrix test for the study variables. For all variables studied, except for labour, which has linear negative correlation with real GDP per capita. There is a strong negative correlation between official exchange rate and all the variables studied. Furthermore, the principal diagonal of the correlation matrix shows appositively perfect correlation.

Table 4: Correlation Matrix

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) RealGDPpc	1.000						
(2) ExDebt	0.387	1.000					
(3) CapExp%GDP	-0.506	-0.210	1.000				
(4) CapitalForm%GDP	0.265	0.034	-0.035	1.000			
(5) LabourForce	-0.058	0.466	-0.066	0.022	1.000		
(6) OfficialExRate	-0.274	-0.175	0.271	-0.031	-0.074	1.000	
(7) FDInetinflows%GDP	-0.050	-0.069	0.329	0.471	-0.028	0.107	1.000

Source: Loggu-Naa (2022).

Panel Unit-Root Test Results

Fisher-Type Test of Stationarity

Testing stationarity for panel data may help avoid the estimation of unrelated regression which is often thought of as a time series phenomena. 2N degrees of freedom is the inverse chi-squared statistic for the chi-square distribution.

The following theories serve as the foundation for our decision-making process: Ho: that all panels have unit roots, and the Ha: that at least one panel has a long-term trend.

From Table 5, the inverse chi-square, inverse normal, inverse logit and the modified chi-square values six (6) variables are statistically significant at less than 1% significance level.

The Hausman was conducted to use between the panel fixed effects and the panel random effects appropriateness.

The Hausman test have the null hypothesis (Ho) as;

(Ho): random effect model is appropriate and

alternative hypothesis (Ha);

(Ha): fixed effect model is appropriate.

Table 5: Result of Fisher-Type Unit-Root Test

Ho: All panels contain unit roots Ha: At least one panel is stationary

Number ofpanels = 37

Variable	Inverse Chi-Square	P-Value	Inverse Normal	P-Value	Inverse Logit	P-Value	Modified Inverse Chi-Square	P-Value	Obs
RealGDPpc	264.972	0.000	-11.165	0.000	-11.753	0.000	15.698	0.000	777
ExDebt	66.577	0.717	1.551	0.939	1.426	0.922	-0.610	0.729	777
CapExpenditure	234.059	0.000	-9.769	0.000	-10.238	0.000	13.505	0.000	741
CapitalFormation	214.225	0.000	-8.772	0.000	-8.988	0.000	11.526	0.000	752
LabourForce	98.374	0.031	-1.404	0.080	-1.583	0.057	2.004	0.024	777
OfficialExRate	157.228	0.000	-6.351	0.000	-6.358	0.000	7.102	0.000	507
FDInetinflows	11.526	0.000	-9.802	0.000	-9.936	0.000	12.389	0.000	740

Source: Loggu-Naa (2022).

Table 6: Hausman Test, Panel Fixed Versus Random Effect Models

Test: Ho: difference in coefficients not systematic
chi2(18) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 5537.03
Prob>chi2 = 0.000
(V_b-V_B is not positive definite)

Source: Loggu-Naa (2022).

From Table 6, we fail to reject the alternative hypothesis. The coefficient of natural logarithm of external debt is negative 0.964. This implies that a one percent increase in external debt is associated with a 0.096 percent decrease in economic growth on the average, holding other factors constant.

The coefficient of capital expenditure percent of GDP is negative 0.009 and it has a higher probability of 0.000, which is less than the statistical significance level of 1 percent.

Table 7: Results of Random Effects GLS Model

R-square = 0.985 Wald chi2(7) = 30386.05

Corr(u_i, X) = 0 (assumed) Prob > chi2 = 0.000

lnRealGDPpc	Coefficient	Std.Err	z	P > |z|
lnExternalDebt	-0.964	0.009	-99.53	0.000
CapitalExp%GDP	-0.009	0.000	-19.67	0.000
CapitalFormation%GDP	-0.001	0.000	-2.40	0.016
lnLabourForce	-0.876	0.023	-37.06	0.000
lnOfficialExRate	0.002	0.004	0.25	0.802
FDInetinflows%GDP	0.001	0.000	0.24	0.813
ln(ExDT*Capexp)	0.972	0.007	138.49	0.000
Constant	-1.436	0.278	-5.16	0.000

Source: Loggu-Naa(2022).

Discussions

Coefficient of the interaction between external debt and capital expenditure is positive 0.972 and it is highly significant at the 0.000.Hence, investment in capital expenditure would be associated with a 0.972 percentage increase in economic growth in SSA.

Table 8: Results of Fixed Effects (within) Regression Model

R-square = 0.986 F(7,432) = 4624.95

Corr(u_i, Xb) = -0.0353 Prob > F = 0.000

lnRealGDPpc	Coefficient	Std.Err	t	P >|t|
lnExDebt	-0.906	0.012	-70.85	0.000
CapitalExp%GDP	-0.008	0.000	-18.43	0.000
CapitalFormation%GDP	-0.002	0.000	-4.16	0.000
lnLabourForce	-0.591	0.048	-12.26	0.000
lnOfficialExRate	-0.004	0.005	-0.97	0.334
FDInetinflows%GDP	0.0002	0.000	0.39	0.697
ln(ExDT*Capexp)	0.919	0.010	87.59	0.000
Constant	-4.633999	0.5422725	-8.55	0.000

Source: Loggu-Naa (2022).

Discussions

Coefficient of external debt is negative 0.906 and significant. Capital expenditure percent of GDP coefficient is negative 0.008 and it has a highly significant p-value of 0.000. This implies a unit increase in the capital expenditure percent of GDP decrease economic growth by 0.008 percent.

The interacted term has a negative coefficient of 0.0002. The p-value of 0.000 is highly statistically significant. This means that a 1 percent increase in

the use of externally borrowed funds in capital expenditure would be associated with 0.008% increase in real GDP per capita in SSA.

Table 9: Results of Arellano-Bond Dynamic Panel-Data Model

Wald chi2(8) = 99120.02 Prob > chi2 = 0.0000

lnRealGDPpc	Coefficient	Std. Err	z	P > |z|
$lnRealGDPpc_{L1}$	-0.021	0.013	-1.55	0.122
lnExDebt	-0.940	0.011	-84.36	0.000
CapitalExp%GDP	-0.008	0.0003	-28.75	0.000
CapitalFormation%GDP	-0.002	0.0004	-5.05	0.000
lnLabourForce	-0.588	0.041	-14.11	0.000
lnOfficialExRate	-0.005	0.003	-1.28	0.200
FDInetinflows%GDP	0.001	0.0004	2.51	0.012
ln(ExDT*Capexp)	0.942	0.010	92.84	0.000
Constant	-4.818	0.516	-9.33	0.000

Source: Loggu-Naa (2022)

Discussions

The coefficient of the natural logarithm of external debt is negative 0.940 and the p-value of 0.000, is highly statistically significant. External debt and economic growth are therefore said to be negatively related. This result confirms the findings of the following authors, Reinhart and Rogoff (2010), Carner, Grennes and Koehler-Geib (2010), Kumar and Woo (2010), who found in their research works a negative relationship between external debt and economic growth.

The capital expenditure as percent of GDP has negative coefficient of 0.008and which indicates that the value is highly statistically significant. This

can be interpreted as a unit increase in expenditure would decrease real GDP per capita by 0.008 percentage points “ceteris paribus”. Hence, variable capital expenditure growth and economic growth exhibit a relatively inelastic relationship.

The coefficient of the natural logarithm of the interaction term is 0.942, has a p-value of 0.000, which denotes a highly statistical significance level of less than one percent. This implies that external debt used through capital expenditure would positively influence economic growth in SSA.

The gross capital formation percent of GDP has coefficient of negative 0.002 and has a p-value of 0.000, this denotes a highly statistical significance level less than 1%. This means that a 1 unit increase in gross capital formation as a percentage of GDP would decrease real GDP per capita by 0.002.

The natural logarithm of labour force has a coefficient of 0.588and it has a p-value of 0.000, which is statistically significant at less than 1 percent significance level.

The foreign direct investment net inflows coefficient is positive 0.001 and this suggested that 1 unit increase in foreign direct investment net inflows would lead to economic growth to increase by 0.001percentage points, leaving all other parameters unchanged.

Table 10: Results of Blundell-Bond Dynamic Panel-Data GMMModel

lnRealGDPpc	Coefficient	Std. Err	z	P > |z|
lnExDebt	-0.947	0.009	-96.51	0.000
CapitalExp%GDP	-0.009	0.0003	-28.24	0.000
CapitalFormation%GDP	-0.001	0.0004	-2.75	0.006
lnLabourForce	-0.696	0.040	-17.34	0.000
lnOfficialExRate	-0.004	0.004	-1.04	0.297
FDInetinflows%GDP	0.001	0.0004	3.11	0.002
ln(ExDT*Capexp)	0.945	0.008	107.47	0.000

Source: Loggu-Naa (2022)

Discussions

The coefficient of the natural logarithm of external debt is negative 0.947. Capital expenditure had a negative coefficient, -0.009 and it had a p-value of 0.000, which is highly statistically significant. This implies any 1-unit increase in capital expenditure as a proportion of GDP would decrease economic growth in SSA to0.009.

The coefficient of the natural logarithm of interaction term is 0.945. The p-value is zero, which is less than the statistical significance level of 1. This means that a one percent increase in external debt invested in capital expenditure would be associated with 0.945 percentage increase in economic growth in SSA on the average, holding all other factors in the model constant. This further shows that when externally borrowed funds are used in capital expenditure it would positively influence economic growth in SSA. Hence, the external debt and capital expenditure exhibit a relatively inelastic relationship.

This study agrees with research works on the interrelationships between public debt and capital expenditure conducted by Appiah (2014) and Aigheyisi (2013) who both produced a direct relationship.

The gross capital formation proportion of GDP coefficient negative 0.001is highly significant.

The coefficient of the natural logarithm of labour force is negative 0.696and has a p-value of 0.000 which is highly statistically significant. That is a 1 percentage increase in units of labour is associated with a 0.696 percent decrease in economic growth all other variables being constant.

Foreign direct investment net inflows coefficient is positive 0.001 and has a p-value of 0.002 which is highly statistically significant at the less than 1 percent statistical significance level. This means that when foreign direct investment increase by 1-unit, economic growth would increase to0.001.

Table 11: Arellano-BondTest Results for AR(1)

	Z	P > |Z|
"Arellano-Bond test for AR(1)"	-0.77	0.440
"Arellano-Bond test for AR(2)"	2.43	0.015

Source: Loggu-Naa (2022)

The Arellano-Bond test first difference of over identification for empirical analysis .

Table 12: Sargan Test of Over Identification

	chi2(14)	P > |chi2|
Sargan test of overid. Restrictions	431.65	0.000
Not robust, but not weakened by many instruments		

Source: Loggu-Naa (2022)

Sargan test results is not weakened by many instruments.This implies that the model estimations would produce unbiased and efficient estimates.

Conclusion

The research overall objective is to assess the influence of foreign debt and capital investment spending on the economic growth and development of nations in Sub-Saharan Africa. The empirical estimation techniques used which included, the panel fixed effects, random effects, Arellano-Bond one-step difference dynamic panel GGM model, and the extended dynamic panel GMM estimation model by Blundell-Bond. The results from all these estimated models were consistent throughout.

Furthermore, the correlation matrix, fishers-type unit root test based on augmented dickey fuller test of serial correlation, and Hansen and Sarjan Over identification tests for instruments validity and also confirmed the appropriateness of the results and normality data used.

Again, the results answered the second research objective by the indication that capital expenditure percent of GDP is related negatively to economic growth in SSA.

Moreover, the third research objective was answered by clearly indication of the interaction term being highly significant and positively associated with real gross domestic product per capita in SSA.

Conclusively, implications of external borrowings are invested through capital expenditure it has a potential in influencing and stimulating national output.

Summary

This chapter presents the descriptive statistics, correlation analysis, and Fisher's panel unit root test. Again, the chapter contains the empirical results from the estimation techniques. Thus, the random effect results, fixed effects results and the Arellano-Bond dynamic GMM results.

The Correlation Matrix and the post estimation tests for instruments validity confirmed the appropriateness of the model and the normality of the data used. The analyses showed that external debt is negatively associated with growth in SSSA countries. The results indicated that capital expenditure as a percentage of GDP is negatively related to economic growth in SSA countries. The interaction between external debt and capital expenditure was statistically significant and positively associated with economic growth in SSA.

Therefore, the implication of the findings is that externally borrowed funds, when invested through capital expenditure would have much potential to influencing and stimulating growth.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

The findings are summarized and discussed in this chapter. The chapter highlights the research Problem Statement, objectives, methods, findings and discussions in a concise summary.

Summary

Over recent decades, SSA countries have accumulated heavy external debt stocks. The external debt component in countries within SSA sub-region is more than the domestic debt components as indicated in previous studies. The major goal of the research was to evaluate whether or not the massive foreign debts when directed via capital spending may have the potential of encouraging increase in national productive capacity in SSA.

Whilst some researchers and economic analysts posit the positive relationship that exist between external debt and real GDP per capita of countries. Others claim that, the relationship of the two are negative in some countries. Some other studies also suggest that there is no such relationship between external debt and economic growth in countries. These earlier studies also differ in terms of methodological and statistical approach across regions, countries and regional trade blocs.

Some studies focused on rich economies, while others focused on Latin America for those studying the LDC. While previous research has focused on how external debt impacts national output, less emphasis is on how government capital investment influences economic growth, particularly in

SSA. Recent empirical studies conducted on SSA public debt and economic growth included the following,

Considering the lack of attention paid to determining where external debts are funnelled, this research serves as a reason to perform such. Furthermore, the study sought to standout differently from other studies and recent data from the WDI dataset. The study again employed the panel fixed effects, random effects, one-step difference GMM model, and the restricted dynamic panel GMM estimation techniques. Large debt load in relation to a country's endowment resources might lead to limited national output. In the nut shell, the findings satisfied the three objectives.

Conclusions

Essentially the research work concerns high debt stock levels in countries in Sub-Saharan Africa. Most research and scholarly works mainly explain the debt-to-GDP thresholds and little is investigated about the aspect of the economy that the huge debts accumulated are spent.

The study analysed panel fixed effects, panel random effects, one-step difference dynamic panel GMM model and restricted one-step difference techniques are used to capture the key variables effects on economic growth in SSA countries for the period.

The findings revealed a considerable negative effect of external debt on real GDP per capita in SSA and a positive interaction term effect in SSA nations. There are also positive and major impacts on economic development from the lag of real GDP per capita and government consumption expenditure.

Policy Recommendations

The policy suggestions are provided based on the findings and analysis of foreign debt and capital expenditure relationship with real GDP per capita in SSA.

The major conclusions are external debt impedes development in SSA. This means external debt levels are negatively associated with economic growth. Capital expenditure is negative and insignificant. More importantly, the interaction term is positive and significant.

Therefore, the study recommends that external debts in SSA countries can only promote economic growth if the borrowed funds are channeled through capital expenditure with prudent debt management strategies and with the private sector playing an active role.

Firstly, the study recommends policy makers to consider external debt strategies to ensure prudent use of external loans. More seriously, governments in the SSA countries need to embrace debt sustainability strategies that can stand the test of time. More debt relief programs and other measures targeted at resolving structural imbalances and budgetary deficits should be negotiated with creditor organizations such as IMF and World Bank. Governments in SSA countries should as well institute workable fiscal discipline policies to reducing public funds mismanagement, corruption, profligate expenditures and other financial irregularities by government agencies to reduce the budget deficits in these countries.

Furthermore, Policy makers should ensure that governments do not rely so heavily on external debts to finance current or non-productive expenditures. More practically, borrowed funds should not be used to finance government

consumption expenditures, payment of subventions, salaries, emoluments and payment of previous loans, instead borrowed funds should be used as injectors into the economic growth equation which in the medium to long term could yield substantial returns for development.

Additionally, the governments of SSA should focuse on acquiring concessional base as against commercial loans which in the literature are said to be contracted more.

Finally, Governments in their quests to promote growth and development need not to heavily relay on foreign loans but adopt efficient and robust revenue mobilisation framework. A tax regime that would encourage productivity among local industries making them price competitive in the international market. This increases exports and reduce imports thereby positioning the region favourably in terms of trade balance.

Areas for Further Research

Future research could consider investigation on the topic at country-specific level. Again, the sources debt and their effects on economic growth is an area for further research**.**

Finally, future studies could consider the external debts of countries based on income groupings of countries for comparative analysis.

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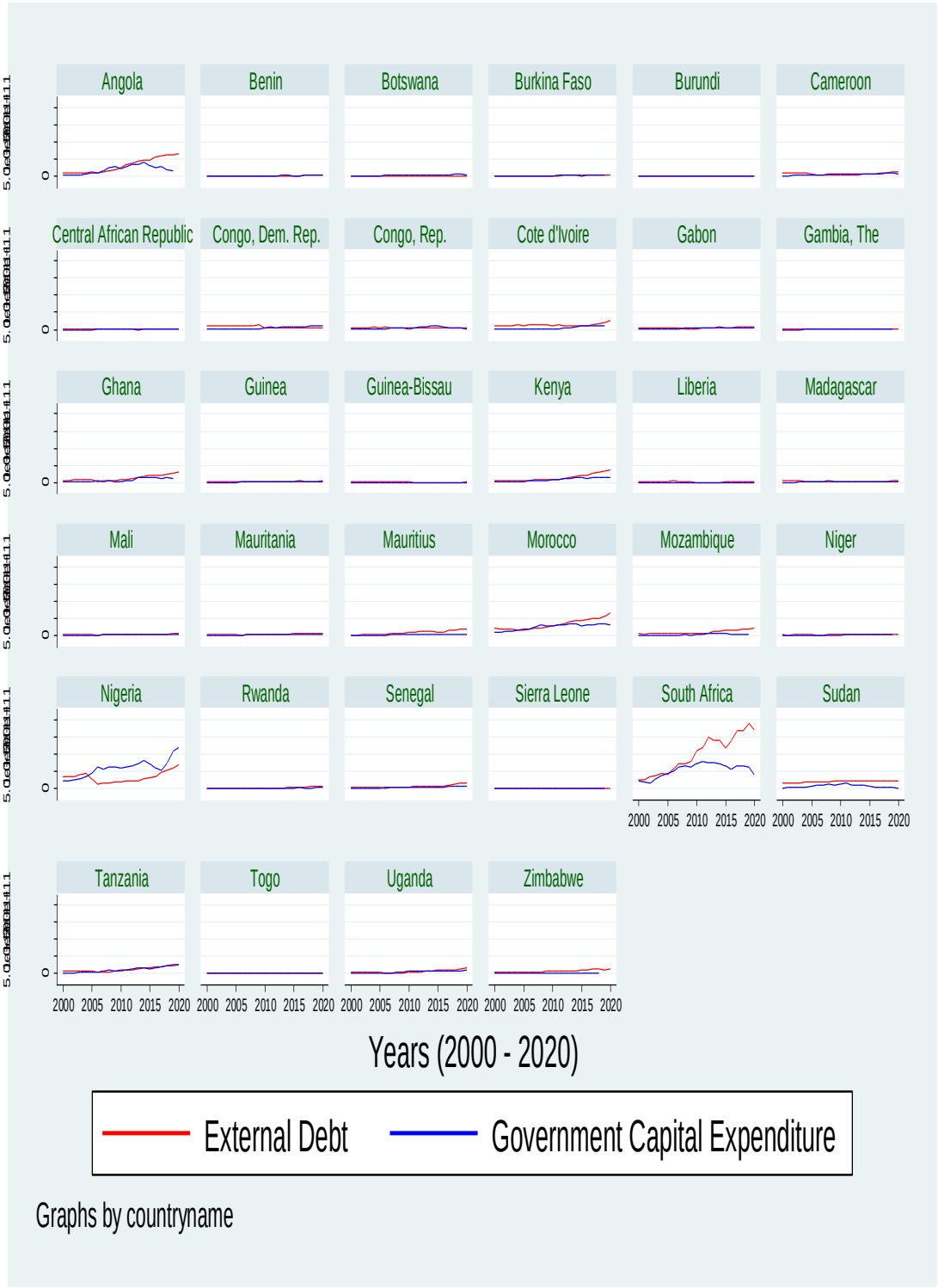
APPENDICES

A**:** List of Selected SSA Countries for the Study

37 Selected SSA Countries		
(1) Angola	(14) Estiwani	(27) Nigeria
(2) Benin	(15)Gabon	(28) Rwanda
(3) Botswana	(16)Gambia	(29) Senegal
(4) Burkina Faso	(17) Ghana	(30) Sierra Leone
(5) Burundi	(18) Guinea	(31) South Africa
(6) Cabo Verde	(19) Guinea Bissau	(32) Sudan
(7) Cameroon	(20) Kanye	(33) Tanzania
(8) Central African Republic	(21) Madagascar	(34) Togo
(9) Chad	(22) Mali	(35) Uganda
(10) Comoros	(23) Mauritania	(36) Zambia
(11) Congo, DR	(24) Mauritius	(37) Zimbabwe
(12) Congo, REP	(25) Mozambique	
(13) Cote d' Ivoire	(26) Niger	

B: Trends of External Debt, Capital Expenditure, and Real GDP per capita



Source: Loggu-Naa (2022)

C: Summary Statistics of Transformed Variables

Variable	Mean	Minimum	Maximum	Std. Dev	Skewness	Kurtosis	Jarque-Bera	Prob	Obs
lnRealGDPpc	6.912	4.732	9.324	0.973	0.512	2.674	71.488	0.000	777
lnExDebt	21.997	18.687	25.945	1.354	0.190	2.819	5.715	0.057	777
CapitalExp%GDP	21.997	46.130	193.265	13.508	-0.223	8.021	777.344	0.000	741
CapitalFormation%GDP	21.426	1.096	81.021	9.036	1.476	8.610	1247.552	0.000	752
lnLabourForce	15.080	11.755	17.962	1.398	-0.467	2.483874	36.6240	0.000	777
lnOfficialExRate	5.114	-3.112	8.803	2.196	-0.989	3.312	83.562	0.000	507
FDInetinflows%GDP	3.729	-11.198	46.275	5.443	3.481	20.040	10349.011	0.000	740

Source: Loggu-Naa (2022)

D: Correlation Matrix of Transformed Variables

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) lnRealGDPpc	1.000						
(2) lnExDebt	0.215	1.000					
(3) CapitalExp%GDP	-0.516	-0.279	1.000				
(4) CapitalFormation%GDP	0.381	0.180	-0.035	1.000			
(5) lnLabourForce	-0.289	0.721	0.026	-0.017	1.000		
(6) lnOfficialExRate	-0.407	-0.248	0.182	-0.032	0.011	1.000	
(7) FDInetinflows%GDP	-0.026	0.017	0.329	0.471	0.017	0.002	1.000

Source: Loggu-Naa (2022)

E: Hausman Test of Fixed Effect Versus Random Effect Models for Transformed Variables

Variable	Fixed (b)	Random (B)	(b – B)
lnExDebt	0.080	0.105	-0.025
CapitalExp%GDP	-0.004	-0.008	0.003
CapitalFormation%GDP	-0.001	0.004	-0.005
lnLabourForce	0.5213	-0.261	0.783
lnOfficialExRate	-0.0001	-0.000	0.000
FDInetinflows%GDP	-0.002	-0.002	-0.000

Source: Loggu-Naa (2022)

F: Skewness/Kurtosis Tests for Normality

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	…Joint adj chi2(2)	…… P >|chi2|
lnExDebt	777	0.029	0.309	5.73	0.056
CapitalExp%GDP	741	0.013	0.000	.	0.000
CapitalFormation%GDP	752	0.000	0.000	.	0.000
lnLabourForce	777	0.000	0.000	34.31	0.000
lnOfficialExRate	507	0.000	0.150	49.99	0.000
FDIinflows%GDP	740	0.000	0.000	.	0.000
ln(ExDT*Capexp)	741	0.000	0.969	15.74	0.000

Source: Loggu-Naa (2022)

G: Random Effect, Fixed Effect, Arellano-Bond Dynamic GMM, and Extended Dynamic GMM Estimations

	Random Effects		**Fixed Effects**		**Arellano-Bond GMM**		**Blundell-Bond GMM**	
Variable	**Coefficient**	**P-value**	**coefficient**	**P-value**	**coefficient**	**P-value**	**Coefficient**	**P-value**
lnExDebt	-0.964	0.000	-0.906	0.000	-0.940	0.000	-0.947	0.000
CapitalExp%GDP	-0.009	0.000	-0.008	0.000	-0.008	0.000	-0.009	0.000
CapitalFormation%GDP	-0.001	0.016	-0.002	0.000	-0.002	0.000	-0.001	0.006
lnLabourForce	-0.876	0.000	-0.591	0.000	-0.588	0.000	-0.696	0.000
lnOfficialExRate	0.001	0.802	-0.004	0.334	-0.005	0.200	-0.004	0.297
FDInetinflows%GDP	0.0001	0.813	0.0002	0.697	0.001	0.012	0.001	0.002
ln(ExDT*CapExp)	0.972	0.000	0.919	0.000	0.942	0.000	0.945	0.000

Source: Loggu-Naa(2022)