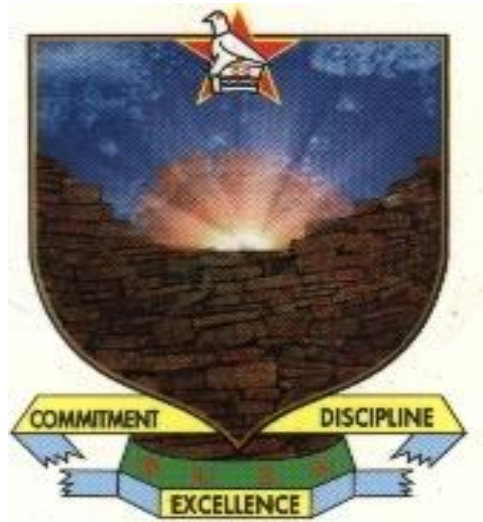# BINDURA UNIVERSITY OF SCIENCE EDUCATION

THE IMPACT OF EXTERNAL DEBT ON ECONOMIC GROWTH FOR

SUB SAHARAN AFRICA

(2002-2020)

BY

WASHINGTON KAMASHA

B190656A

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DEDICATION

This dissertation is devoted to my mother, Jesca Mamvura, who has served as the driving force for most of my academic accomplishments and ultimately, to all those who shared their wisdom with me through educating as well as researching. **GOD ALMIGHTY BLESS THEM ALL.**

ABSTRACT

Within scholarly as well as political community, there has been a discussion about the impact of foreign-debt upon economic-growth. The majority of SSA countries have endured significant rates of foreign debt as well as weak economic progress. It is notable that there has been opposing theories about how external debt affects economic growth. While many contend that foreign-debt slows growth because it discourages investments, others contend that foreign-debt is growth-enhancing. This research looked at how foreign-debt affected SSA's economic-growth from 2002 up to 2020. The research used Fixed Effect Model (FEM) for a collection of thirty SSA nations in order to achieve this goal. Dual-gap model served as a foundation for this theory. The findings from a panel estimating approach called the FEM demonstrate that the ratio of the foreign-debt stock to the gross domestic product have a statistically-significant adverse impact upon by 0.030%. This falls line with the idea that foreign-debt discourages investments, thus slowing down economic growth. A favorable correlation between growth, domestic investment and increase in population was also discovered. Nevertheless, it was shown that debt service payments and corruption (dummy variable) were not substantial factors in SSA's productivity expansion. From 2002 to 2020, it's possible that debt-overhang had been the primary factor that foreign debt used to harm SSA's economic-growth. According to this research, nations in SSA region should refrain from taking large loans in-order to prevent the negative effects of debt-overhang. The World Bank Database served as the primary source of information for this research's data.

ACKNOWLEDGEMENT

I want to express my sincere appreciation to the almighty God, my supervisor, my parents, as well as my colleagues who helped me in completing this study successfully.

 to begin with, I want to express my gratitude to the heavenly father for his unfailing love and kindness, which have enabled me to advance throughout my academic career to this point. Every honour, acclaim, as well as devotion are due to his sacred name. Additionally, I want to express my deep gratitude to my supervisor, Dr. Kairiza, who gave me the advice I needed to complete my task. Without him, I would not have known where I was going. I also like to thank the instructors under the department of economics for their assistance.

Additionally, I would want to extend my gratitude to my friend Yvette. I sincerely appreciate your help, and I will always be beholden to you for it. Last but not least, I want to thank my mother, Jesca Mamvura for her financial

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ACRONYMS

AfDB	African Development Bank
GDP	Gross Domestic Product
GNP	Gross National Product
FEM	Fixed Effects Model
ILO	International Labour Organisation
IMF	International Monetary Fund
OECD	Organisation for Economic Cooperation and Development
OLS	Ordinary Least Squares
REM	Random Effects Model
SSA	Sub Saharan Africa

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CHAPTER ONE

1.0 Introduction

The relationship between public external debt and economic growth is still up for discussion in in the intellectual works, though extensively researched. Literature on the relationship between debt and economic growth appears to fall into two major areas. The first one is foreign debt promotes growth (Warner,1992 and Jayaram and Lau, 2009). When foreign debt is used to fund profitable investment, growth is relatively boosted. On the contrary, a number of others claim that public debt external debt slows economic growth (Siddique et al, 2015, Kozali 2007 and Clements, 2003). In addition, the crowding out and debt overhang impact are the explanations for the growth-depression effect.

It is notable that the economies of Sub-Saharan Africa are deeply indebted. In reality, globally the Sub-Saharan Africa is portrayed as one of the most deeply debt-burdened region with it's debt- burden increasing by $702 billion in the year 2020 (World bank, 2021). There are pull factor that encourage a person to ask a question about SSA nations given the several lines of research on relationship between public external debt and economic growth. Does the amount of Debt that has grown overtime promote or inhibit growth? The investigation was inspired by this question. In this regard, this research examines the impact of public external debt on economic growth for thirty nations in the SSA region from the year 2001 to 2020. This research employs the Fixed Effects Model (FEM), a panel estimation technique to produce practical insights for the linkage between debt and growth in Sub Saharan Africa.

1.1 Background

Since the late 1960s, almost every country in SSA area has been afflicted mostly by Debt problem, which has resulted in the building of enormous public debt balances. The financial meltdown is a widespread issue which affect the globe as a whole whereas, people in Asia, and Latin America also encountered it. Conversely, the only difference with SSA's external debt against that of other areas is that it is owing to bilateral creditors and multilateral creditors which includes the World Bank, the African Development Bank, and the International Monetary Fund,

as opposed to most of the Latin America' s debt, which was owed to commercial banks (World Bank, 2021).

The difficulties of high external Debt for SSA countries were seen as development-relate, with every state in the region anticipated to rebound from these difficulties over time. Whereas in the Latin American region, the external debt difficulties for the states involved were viewed as a major risk for the International Financial system thus attracted most of the awareness (Abbot, 1993). In contra to other regions, SSA nations continued to borrow until they were unable to service their loans and this is because of the sufficient time given to them in order to pay their obligations.

SSA's debt crisis was caused by a variety of circumstances thus, interior and exterior factors. The 1970s shocks of oil price are cited as having had external impacts. Globally, the prices of oil rose by an amount never seen before in the years 1973 -1974 also 1979 -1980 (Kruegar, 1987) . Dembele (2006) noted that several SSA nations, specifically the ones that depended heavily on oil that's imported, experienced BOP deficit as a result of these abrupt changes in oil prices. Nations afflicted with BOP shortfalls which were loaned heavily from foreign sources like World Bank and International Monetary Fund as a solution to the issue of oil price increases.

After the war between Israel and Egypt in 1973, oil shocks in the period 1973-1974 caused chaos on the global market. With raising market valuing, manufacturers in the automated world offset the impact of rising costs of oil. Due to the burdens of inflation caused by this in a more technically advanced world, several SSA nations are now experiencing BOP issues (Eligayehu, 2013). The current account shortfall in billions rose from 8.7 to 42.9 in the years 1973 and 1974 respectively. Due to this shortfall, SSA nations had to loan money from abroad.

Upon the hitting of the oil disaster for the second time, SSA had debt of $336 United States Dollar. OPEC's decision to raise the oil price from thirteen to thirty-two United States Dollar per barrel was a major contributor to this disaster. After the oil disaster, there was the implementation of restrictive monetary policy. This made the situation of the SSA, which proceeded to borrow money from abroad, worse.

The world financial crisis of 1979-81 came after the second phase of the oil disaster. Around this time, increasing interest rates started to appear thus, increasing SSA's difficultly of servicing it's

debt. The slump that occurred during this timeframe reduced demand for basic goods exports. As a result, this gesture increased fiscal crisis and BOP deficits that turned to massive foreign debt in SSA countries in order to pay for these foreign and fiscal inequalities (Oreyma, 2014).

World Bank and IMF arrived at an answer to these escalating interest rate and the unstable prices of basic goods in the late 1989s. The suggested treatment were the Structural Adjustment Programs thus, SAPs (Trevor, 2014). These programs were used with the aim of promoting sustainable development in the meddle-long term and stabilizing under short-term (ILO, 1996). The foreign debt actually got worse as a result of this technique, implying that a conflicting effect. In comparison of the proportion of debt as to economic growth in the 1970s among SSA, South Asia and Latin America being 14.1 %, 15.4 %, 18.6 % respectively. For SSA in the 1980s the proportion increased twofold, while it slightly increased in South-Asia (Elbadawi, 1992). SSA States then discovered towards the conclusion of 1990s that they were not only heavily in burden but likewise they were basically incapable of refunding their obligations because it represented close to a hundred percent of its combined Gross domestic product.

It is impossible to comprehend SSA's huge external debt without taking a close look at the domestic problems that have led to the problem's aggravation. The main internal factors leading to the to debt disaster are the erosion of institutions, oppressive and dishonest governments, poor governance, and conflicts (Oxfam, 1999). Sub Saharan Africa borrow money from outside sources to fund its economic expansion together with other necessities. The bulk of the nations within the SSA are underdeveloped, and because of their limited domestic savings, it is difficult for them to fund its national as well as development ambitions (Krumm, 1985). Due to the fact that the majority of these countries were affected by armed conflicts and severe drought, they loaned funds to accomplish objectives such as the building of infrastructure and the purchasing of food stuffs. The bulk of initiatives, unfortunately, did not succeed in earning enough money to refund on loaned money; some also went so far as to abuse the finances, which increased foreign debt.

The enormous accumulation of debts In SSA effectively demonstrates the region's inability to pay back its debt. According to three theories, SSA has a higher level of debt than the rest of the world does. Firstly, SSA's debt-to-export-revenue relation has been increasing more faster than that of other continents, peaking in 1987.

1.**2 Problem Statement**

Regardless of the actuality that almost all of Sub-Saharan nations' productivity expansion is fueled through foreign-borrowing, the debt-overhang introduced through the borrowing of funds externally has been among numerous elements that has made a significant contribution to the under-performance of such countries. According to debt-overhang as well as dependence theories, the stock of foreign-debt has an impact upon the productiveness of a country, which results in weak growth. Pattillo (2002) as well as Siddique et al. (2015) provided empirical evidence in favor of the idea that a debt-overhang has a negative impact upon a country's gross domestic product. The reality that debt had been obtained at extremely low interest rates resulted in debt-overhang since its repayment became unaffordable but also, in some cases, nearly unattainable. Nevertheless, until a factual study is conducted upon this issue, nobody can depend on such a simple assumption in an informative manner. This serves as the driving force for this investigation.

1.3 Aims of the research

This research 's primary goal will be to ascertain how foreign debt affects economic expansion for the chosen group of SSA nations in order to answer this study topic.

This research mainly aims to:

a) ascertain how these chosen SSA nations' economic expansion is impacted by payment made in repaying their foreign debt.

b) ascertain how economic growth has been affected by domestic investments for the chosen SSA nations.

1.4 Research question

The questions listed below served as the research's guiding principles:

a) What impact does foreign debt have on economic expansion in Sub-Saharan African nations that have been chosen?

b) How does the growth of the economy in the chosen SSA nations affected by payment of foreign debt service?

c) What effect does domestic investment have on the growth of the economy in the chosen SSA nations?

1.5 Research hypotheses

Since it has the potential to a beneficial effect and also be utilized to raise social welfare, it is still extremely difficult to predict how foreign debt would affect the growth of the economy. It can sometimes have a negative impact on economic growth due to crowding out effect and the overhang of debt, which discourages investing but rather promotes capital competition. These underlying hypotheses will be put to the examination by the researcher:

H_0=Economic expansion is inversely correlated with external debt.

H_1= Economic growth and public external debt are strongly correlated.

1.6 Significance of the study

Due to the fact that foreign debt may potentially stimulate as well as slow down the growth of the economy, its impact upon this growth is uncertain. taking it from one extreme, funding lengthy profitable investments for emerging nations assist in covering up constraint resources by promoting the growth of the economy. In contrast, foreign debt is linked to crowding out effect and the overhang of debt, that deters investments but rather results in capital competition. Together, they both have a negative impact on the growth of the economy. Considering such conflicting viewpoints, an analytical study of the matter could be able to produce useful information about the link that exists for Sub-Saharan African area. These following groups should find the research helpful:

Decision-makers

This project's goal is to identify strategies for helping SSA nations lower their foreign debt loads and boost growth. This study is significant because the findings upon this relationship between the growth of the economy and foreign debt might help formulate policies that would save nations against defaulting or creating a scenario where they have an excessive amount of debt.

For academics

The research shall add much volume to the current studying material because it employs an element of panel data, that is significantly comprehensive and potentially generalized, to examine how foreign debt affects growth in SSA nations. In accordance with Hausman testing outcomes, this research applies the Random and Fixed effect models that are disregarded with most researchers who employ the OLS approach.

1.7 Assumptions

This research relies on the underlying presumptions in order to analyze how foreign debt affects the growth of the economy:

- All information utilized under this study is precise, thorough, useful, as well as dependable

- Additionally, it is presumed that the study's credibility was not adversely impacted by any constraints which were discovered.
- It's also presumed that material employed in this study reflects the reality that exists as well as the group utilized is a representative of the entire population SSA nations.
- The findings produced by the applied econometric model are solid as well as trustworthy.

1.8 Term definitions

1.8.1 External debt
External debt is referred to as a fraction of a nation's overall borrowed funds from lenders abroad. Either the state, businesses, or private households could be the borrowers. External debt is debt unsettled to non-residents that can be repaid with money, services, or products, according to World Bank. The total of long-term public debt that is publicly guaranteed, short-term debt borrowed using IMF credit, and public long-term debt is known as total external debt.

In 1984, the term "external debt" was employed by a group working on external debt statistical data for four global organizations, such as the Organization for Economic Cooperation and Development, the International Monetary Fund (IMF), Bank of International Settlements (BIS), and the World Bank, to refer to the total amount of actual current liabilities that are due to non-residents and are not contingent (Klein, 1994).

1.8.2 Economic growth
economic growth is characterized by the rising in the market value over-time of the products and services generated in an economy. Economic growth may also be characterized as the public's long-term ability to get an array of economic commodities. Rise in state's output, as determined by measuring its Gross National Product from one period to the preceding (World Bank, 2008).

1.9 Limitations
The researcher employed secondary information for this research, that has constraints of its own. It really is undeniable that there are issues with data nature, stability, precision, and dependability in emerging nations, especially Sub-Saharan African countries, because information is frequently wrong. The researcher analyzed World Bank's data to find a solution.

1.10 Delimitations
Because of the constrained accessibility of data, this study focuses on thirty (30) states for the period of 2002- 2020. Angola, Chad, Comoros, Burundi, Benin, Central

African Republic, Botswana, Congo, Dem. Rep, Cameroon, Cote d'Ivoire, Kenya, Gabon, Lesotho, Ghana, Guinea, Madagascar, Mali, Mauritius, Mauritania, Mozambique, Niger, Nigeria, Togo, Rwanda, Sudan, Senegal, Sierra Leone, South Africa, Tanzania, Uganda, and Zimbabwe are among the nations covered by the researcher.

1.11 Organization of the study

The backdrop for the study problem, statement, and objectives of the research, the study hypothesis and questions, as well as the defining of terminology are all provided under the first Chapter. The research further discusses limitations as well as delimitations. The foundation of the entire research is covered in this chapter. Literature review is covered in chapter two. Chapter three focuses mostly on research methods, whilst chapter four details the research's findings. Summary of facts, conclusions, and policy suggestions are covered under the fifth Chapter.

<center>**CHAPTER TWO**</center>

<center>**LITERATURE REVIEW**</center>

2.0 Introduction

 as previously mentioned, this section contextualizes the present research within the scope of existing research. This then draws attention to the factual as well as theoretical literature which relates external debt to the growth of the economy. Additionally, it addresses the direct and indirect ways that external debt has an influence on the debt problem. This section likewise offers this research's theoretical foundation.

2.1 Theoretical Review

2.1.1 Theorem of the debt overhang

According to Krugman (1989), a debt-overhang occurs when the projected payback on external debt is less than the agreed legal value of the obligation. According to this hypothesis, domestic and foreign investment will be hindered by predicted debt servicing when a nation's debt is anticipated to exceed the capacity of a country with some future profitability. This would result in slower economic development. The outcome of all of this will be that economic development will be hindered as part of the profits from investing in the local sector are essentially taxed away by current external creditors, both internal as well as external investors (Classes et al., 1996).

Debt overhang is another term used by Bornstein (1990) that describes the circumstance under which a state with a massive debt burden will only receive modest advantages out of the profits on new investments since these states will have significant debt servicing commitments. When investors are discouraged against spending within the private sector due to high taxes levied upon them by the state, in other words it is known as tax disincentive and this is when the debt overhang phenomenon is thought to occur. Whenever the nation has significant debt service payments as well as rising debt stocks, it is certain that the state will strongly tax whatever prospective income received by new investors in order to settle down the shortfall stocks. The said action deters investors, which lowers investments in the economy in general but also slows the percentage of expansion (Ayadi and Ayadi 2008).

 Morisset (1991) claims that debt overhang discourages investments, particularly through private sector because an outcome of expectations regarding the policies of the economy which will be necessary to service debt, such as rising taxes. In other words, if the administration of a debt-ridden country is incapable as well as reluctant to make debt refund as a result, the private sector investors foresee relatively high taxes both on real and financial assets. additionally it implies that, until a certain

<center>8</center>

degree, external debt encourages investments, but after that point, debt overhang eventually begin to exert adverse pressure upon the investors' desire of providing private capital. SSA area is home to several nations with large debt overhangs with rising debt stock levels. Reduced investments is one of the numerous effects of debt overhang that SSA nations are currently dealing with. This issue was first raised in the late 1960s, when they suffered from expenses in an effort to boost productivity. Because of the rising rates and incapacity to pay off such arrears, these are accumulating and are impacting the present-day and also succeeding generations.

There have been numerous government crises in SSA as a result of such a huge debt load. As an illustration, Seychelles government missed its payment obligations of $230 million Eurobond in the year 2000 in October as a result of a significant decline in tourism income as well as excessive state expenditure. SSA's indebtedness problem has grown significantly and attracted major notice. Given that debt stock in SSA serves as an explanation for the debt overhang concept, the idea appears to crop up relevancy in Sub-Saharan Africa. Twenty-seven of the thirty-three least developed nations that are now categorized as extremely poor nations with heavy debt stocks and they are located in SSA, making the continent's nations the poorest globally.

2.1.2 Crowding in and crowding out consequences

According to Keynesian macroeconomics theories, more public expenditure as a result of foreign borrowing might spur local investments and the growth of the economy (Baldacci et al., 2003). Such approach might 'crowd-in' investment, which might have a beneficial impact on the growth of the economy. According to Pattilo et al. (2002), any poor nation's foreign loans can boost growth to a point and beyond that it will actually slow down growth. If the infused funds is directed in profitable industries, a nation's economic expansion will be positively impacted by its foreign debt.

During their study of crowding-out consequences, Clements et al. (2003) discovered how government savings are decreased as a result of foreign debt which might result from greater debt payment plus rising interest costs. Consequently, the increase of interest rate discourages private investments as well as slowing the growth of the economy.

The crowding-out phenomenon happens whenever the state slush up taxes or increases borrowing to pay for greater spending, which discourages private investments through

the driving up of interest rates. The Government-deficit expenditure displaces private expenditure, according to Krugman (1989). Besides the impact of an increased stock of debts upon investments, foreign debt could potentially have significant impact upon growth due to cumulative repayments that seem suitable in crowding-out investments for an economy, according to Cohen (1993) and Clements et al. (2003). The crowding-out phenomenon restricts resources that may be used in the country's economy since the majority of them are used in paying off foreign debt, that lowers the amount of investments. The concept underlying the crowding-out phenomenon is that a nation with significant debt redistribute resources towards paying down debt instead of making investments domestically. Based on the crowding-out phenomenon, a nation's inability in allocating resources towards worthwhile investments leads to higher public interest costs as well as budget deficits, which reduces government savings.

The countries of Sub-Saharan Africa took on foreign debt, as a result they are presently required to pay off that debt by levying heavy taxes. This therefore produce a result of discouraging potential investors, so they choose to place their money elsewhere. The decline in SSA's industrial sector is a blatant sign of a crowding-out phenomenon.

2.1.3 Solow growth model

The Solow Growth model, that was created by Solow in 1956, is a well-known economic growth theory. This concept is founded upon a variety of presumptions, including that savings as well as investments rates remain constant that the production function depends on labour, capital, as well as technological investments. Additionally, resources are supposed to be employed effectively but there are decreasing rewards upon both labour and capital. The Solow hypothesised that an economy-wide production may be condensed as well as expressed in the following way:

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

With reference to the above model, A reflects the current state of technology, whilst L is the amount of labour utilized and Y is the total economic output. The size of produced capital is also represented by K. The outputs will rise if any of the inputs is increased. Nevertheless, the output is defined by declining marginal productivity, which limits a growth in per capita (Burde, 2005).

According to the Solow-growth concept, technical advancement rather than savings and investments will determine growth in the long-run. This then indicates that while foreign debt may promote growth within the near term, it may also result in declining returns for every input over time. Therefore, in the long-run, external financing must be employed towards technical progress whenever there are no technological advancements.

Although the theory forecasts that a rise in labor, capital, and technology will lead to the growth of the economy in SSA, there has been technical advancement, but resources are not directed into economic expansion instead they have been employed for debt payment.

2.1.4 Dependency theory

The dependence hypothesis describes the elements which have helped impoverished nations grow. According to Winfred (2014), this concept was predicated upon the idea that resources are coming out of the outskirts of poor and undeveloped countries to a center of prosperous countries, thus benefiting the rich at the cost of the poor. According to the dependence hypothesis, the wealthier countries benefit from the poorer countries' integration into the global economy whilst the latter is in quest for resources (Todaro, 2003).

Winfred (2014) continues by arguing that this dependence concept shows that the destitution of the peripheral nations is not due to their integration or complete integration in the global economy, as frequently claimed by laissez faire theorists, but rather due to their system integration techniques. Due to various domestic problems, underdeveloped nations are in a condition of backwardness and are constantly dependent.

Because of their underdevelopment, SSA counties rely upon wealthy states for almost everything, including technologies as well as support. Instead of finding smarter ways to improve their economy, they continue to depend upon loans from abroad. Due to the rising interest rates that lenders impose and also the increased cost of repayment, this dependence condition hinders SSA's economic progress.

According to dependence concept, a certain nation or area depends on another in order to be supported or survive. Though SSA nations relies on people with high incomes for the growth of the economic, they also employ their own methods for doing it. Certain nations, including Angola, Nigeria as well as the Congo, Dem. Rep, extract oil, that helps to strengthen their economy.

2.1.5 Dual-gap theory

Chenery and Strout (1966) first proposed the dual-gap concept. They maintained within their explanation that two linkages are essential in influencing the growth of any economy. Firstly, is the association between savings-economic growth, while the second is the relationship between investments and economic growth. Hunt (2007) also backed this claim, claiming that rising investments and savings drive economy expansion. Growth of an economy is contingent upon the capital stock reaching a predetermined level. Investments and productivity increase when capital does as well. The dual gap hypothesis explains why the majority of nations choose foreign financing to raise GDP.

Derivation of the dual gap model

It says that total output equals total spending.

Thus, $GDP = Consumption + Investment + (Exports - Imports) \dots\dots\dots\dots\dots\dots(TWO)$

$GDP + Imports = Consumption + Investment + Exports \dots\dots\dots\dots\dots\dots\dots\dots(THREE)$

Therefore, taking both sides' consumption out, we obtain

Gross Domestic Product – Consumption + Imports = Investment + Export, Since
GDP- Consumption = Domestic Savings

Thus Savings + Imports (withdrawals) = Investments + Exports (injections). This connection may be described like Imports - Exports (foreign-Exchange-Gap) = Investment – Savings (saving-Gap).

The majority of countries generally struggled to close the imbalance linking savings and investments levels and have turned to foreign-borrowing to close this imbalance (Omoruyi, 2005). This imbalance between investments and savings encourages borrowing, which results in

significant foreign debt. According to Chenery (1966), overall purpose of the foreign debt in a dual-gap study is making up for a country's shortage of investments as well as savings in order to boost growth of the economy. It offers a paradigm that demonstrates how domestic-savings alone are insufficient to guarantee progress for each economy as a function of investments.

The majority of SSA nations rely on foreign financing to close the shortfalls identified by this idea. Due to poor manufacturing capacity in some of these nations, such as Zimbabwe, exports remain highly insufficient to bridge the difference between investments as well as savings. According to this hypothesis, foreign debt must close any gaps as well as boosting growth for these nations.

For example, Ghana has struggled with both current account and fiscal deficits. This Ghanaian state used up more money than it brought in, and imports have been outpacing exports in the nation. Macroeconomic instabilities were caused by this situation. Greater government expenditure due to increasing wages and reduced exports income due to low cocoa and gold prices are the two main causes of dual-gap (World Bank, 2010).

2.3 Empirical Review

The research on the relationship connecting foreign debt as well as economic growth is examined in this area. This empirical analysis of foreign debt and economic growth for SSA is still a contentious topic since certain data suggest that foreign debt fosters growth while others show that it has an adverse relationship with it.

2.3.1 Effects of foreign-debt upon the growth of an economy for Sub Saharan Africa

A wide panel of 93 underdeveloped nations was used by Pattillo et al. (2002) for analyzing the effects of external-debt on economic growth from 1969 until 1998. They employed factors familiar to growth research, such as trade openness, education, populations, as well as national budget, both in linear as well as non-linear regressions. Two-Stage Least Squares, OLS, Fixed Effects, and GMM were all applied in the research, and significant findings were obtained. According to their research, a nation experiencing average debt levels could see a reduction in growth of GDP per capita of around a half and a complete percentage level for every time its debt ratio doubled. This analysis likewise found that nations with external debt ratios more than three hundred percent of exports had a two percent decline in GDP rates.

Siddique (2015) examined how much the amount of external debt has an influence on a nation's GDP. This research looked at 40 heavily indebted impoverished nations' both short and long run links with growth and external debt from 1970 until 2007. This research likewise looked at how trading, growing populations, as well as capital formation affect GDP. The findings of employing the ARDL panel statistics estimate model revealed that capital formation does have a significant effect, debt has an adverse effect on growth both over the long and short terms, and populations has a significant effect. Analytical research reveals that a decrease in the debt stock may greatly improve the profitability of the studied indebted nations in the long and the short-run.

Additionally, Fosu (1996) examined the influence of debt upon the growth of the economy in SSA nations using the OLS method. For the years 1980 until 1990, a survey of 35 nations from SSA was employed. Labour, capital, export, as well as foreign debt were the variables considered. Because the research analyzes direct as well as indirect impacts of debt, the direct effects revealed that even if debt servicing payment and total debt may have a negative impact on economic growth, they have no impact on investments levels. According to Fosu (1999), the total debt load does have a detrimental impact on the growth of the economy. For a certain degree of production resources, an unsustainable debt economy does have a GDP growth rate drop of roughly 1%. In addition, this research discovers that without a debt load, gdp in sub-SSA countries was 50% greater during the study period. Additionally, Fosu discovers less indications of a link connecting foreign debt and investments volume.

Iyoha (1999) used datasets between 1970 until 1994 for research to simulate an analysis of the effect of foreign debt on growth in heavily indebted impoverished nations. According to the research 's findings, debt overhangs discourage investments through disincentive and crowding-out phenomenon. The impact of reducing debt on investments and the growth of the economy was also examined under this research. According to the analysis, over a time-frame of 1987 until 1994, a twenty percent decrease in debt could, on average, result in a rise of eighteen percent in investments as well as one percent in growth of GDP. Altogether, this survey's findings suggested that debt-forgiveness may offer SSA the necessary motivation towards investments recovery as well as economic progress.

In their study, Daud et al. (2012) examined the impact of Malaysia's external debt upon the growth of the economy. They employed ARDL test model with the analysis of time series for the years 1960 until 2009. These findings indicated an adverse link between external debt and economic expansion since, above a certain level, it'll still hinder growth.

Kozali(2007) did another comparable research, that was conducted in Turkey. The objective of the research sought to evaluate the influence of external debt upon Turkey's growth in the economy between 1970 and 2005. Gdp, foreign debt, foreign debt payments, debt service, as well as private and public investment were among the research's factors. Analytical evaluation of the research included co-integrations tests, which also included structural break testing procedures. The findings showed that GDP growth is negatively impacted by foreign debt and debt servicing. The usage of external debt in Turkey, he continued, is not distributed effectively, having a bigger negative effect on the Turkish economy. He recommended that the Turkish government implement economic measures that encourage saving.

In their research, Elbadawi et al. (1992) found a connection between impoverishment and foreign debt. Cross- sectional regressing was used in this research to examine ninety-nine developing nations from Latin America, SSA, the Middle East, as well as Asia . This research revealed three ways through which debt in SSA inhibits economic progress. These ways are as follows: previous debt build up, debt service ratio, as well as existing debt inflows as a percentage of Output. Additionally, they discovered that although debt stock promotes growth, debt build up inhibits it.

In order to determine the effect of foreign debt on economic development for deeply indebted nations, Warner (1992) employed pooled panel regression. Data that was utilized in this research was collected between 1961 and 1989. The findings of this study indicated a positive sign on debt problems. The borrowed money was employed in public investments, which boosted economic growth and prevented the debt problem from deterring investments.

Were's 2001 research, that relates foreign debt to its effects upon economic expansion, is yet another research that makes this connection. Were (2001) used accumulation in analyzing the

structure underlying Kenya's foreign debt as well as the consequences on growth in the economy. Accumulation has a detrimental impact on both private investments and growth.

A study involving forty-four SSA nations was done between 1970 till 2002 for a body of research named a cross-country panel data study of foreign debt upon growth by Baraki (2006). The purpose of the research sought to conduct thorough econometric analysis into how foreign debt affects economic growth for SSA nations and also to pinpoint the transmitting mechanism involved. Under this work, Baraki used the random and fixed effects estimations approach to compensate for time as well as country-specific effects. Similar to Baraki, in this study we similarly utilize the Hausman testing to determine whether the model will employ random or fixed effect estimate approach.

Mahmud Hasan Shah (1993) looked at the applicability of Bangladesh's economic system being dependent upon foreign public debt. This research was done between 1974 and 2010. They employed the crowding-out phenomenon as well as debt-overhang in measuring the effects of foreign public debt, plus debt burden was separated into different components: foreign debt stock and external debt service. The findings showed that foreign public debt has a long-run, considerable adverse impact and that the quantity of foreign public debt has a beneficial impact upon economic growth. For the short-run he spotted an adverse impact of foreign debt service, yet the debt stock seemed to have no discernible impact.

The link involving Pakistan's foreign debt and GDP growth during the years 1970 until 2003 was examined by Hameed et al. (2008). Considering time-series analysis data of GDP, debt-servicing, capital stocks, and labour-force, a production function was used to evaluate how such factors impact Pakistan's performance in the economy. Several co-integration techniques were used in conducting this study in order to find long-term correlations amongst the given variables.

In opposition with the results discussed before, Jayaraman and Lau (2009) discover that a nation's amount of debt can actually promote growth. Employing a representative from 6 Pacific Island nations between 1988 to 2004. Variables include stock of foreign debt, exports, and budget deficit, as a proportion of GDP were all regressed against the GDP by the researchers. Under this work, modified OLS was used to evaluate the analysis of panel data. According to their findings, every one percent rise in the stock of foreign debt causes a 0.25percentage increment in GDP. There is no long-term Granger causal link connecting real

GDP and foreign debt, according to Jayaraman and Lau's study, which tested for causality employing a panel-based error-correction approach containing a dynamic error-correction term. It was discovered that the foreign debt as well as GDP had a considerable causal link in the short term.

2.3.2 Effect of foreign-debt service payment upon growth of the economy

Applying the OLS technique, according to Mbire and Atingi (1997), the servicing of debt was among the main reasons Uganda's economy grew very slowly from 1980 to 1990. According to their research, the export as well as debt ratio between between 1990 and 1993 was above 100 percent.

Afxentiou and Sertetis (1996) looked at a study of fifty-five nations that had to make payments for debt servicing between 1970 and 1990. Researchers divided the timeframe under two divisions, with 1970– 1980 representing the era of rising external debt while 1981– 1990 represented the challenge of servicing debt. The purpose of the research sought to determine how borrowing externally affected output. According to their findings, from 1981 to 1990, there was an adverse correlation among national output as well as debt in emerging nations. This has been attributed to the excessive debt build-ups between 1970 till 1980 when outside borrowing were accepted to soften the blow of crude oil prices during the earlier 1970s. Afxentiou and Sertetis (1996) conclude that the adverse association between debts and productivity from 1981 till 1990 came from the abused borrowed funds by the impoverished emerging economies which gave birth to a debt servicing difficulty when they were asked to fulfil their outstanding debts depending on agreed contracts.

2.3.3 Effect of foreign-debt upon domestic Investments in Sub-Saharan Africa

A survey for Thirteen emerging SSA nations from 1960 -1981 as well as 1982 - 1989 is used by Warner (1992). Their findings do not support the idea that debt does have a detrimental impact upon growth of the economy or that foreign debt discourages investments in those emerging nations. To account for the effect of foreign debt upon the growth of severely burdened nations, a dummy variable for the debt problem was added. Their results demonstrate that, contrary to some research' predictions, the debt crisis coefficient really had a positive and substantial sign. Warner (1992) stated that because the money borrowed was spent for public projects, which

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boosted GDP, the indebtedness problem did not discourage investments. Although this research employed a much more reliable dynamic GMM computation, the pooled OLS regression used had weaknesses because such methodology overlooks country-specific factors.

Deshpande (1997) examined Thirteen heavily burdened nations between 1975 and 1991 in an effort that sought to shed light on debt-overhang concept implications upon investments. Two different timeframes, from 1975 -1983 and 1984-1991, were separated within this span of time. The relationship involving domestic investments and foreign debt for the thirteen nations is the subject of an analytical research by the researcher. This research aims to show that in nations with debt-overhang, the consequences of loan repayment affect not just the country's dominant policies but also investments. Under this study, panel data were estimated using the OLS method. The outcomes of the initial period showed that foreign debt had a detrimental effect upon investments. The researcher continued by stating that this indirect relationship between investments as well as foreign debt causes a drop in GDP.

2.4 Summary
In order to analyze the link involving external debt and growth of the economy within SSA, this chapter focused on the theories as well as empirical studies. In general, the majority of researches indicated that a country's level of debt had a negative impact upon growth. Choosing a model to approximate the regression's function linking foreign debt as well as GDP is the focus of the following section.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

Chapter three outlines basic techniques used in examining how foreign debt affected economic expansion from 2002 to 2020 in the Sub-Saharan Africa. Additionally, the model specification is included, along with an explanation of and justification for each of the model's variables and a connection between them and the concepts from the review of the literature.

3.1 Examination of panel data

A statistical technique known as panel data analytics works with both time series as well as cross-sectional data (Maddla, 2001). Due to its ability to track a specific group of people overtime and offer several observations relating to each and every one of them, panel data is often referred to as longitudinal data collection. The use of panel data has the following several benefits. As a result, information is gathered overtime for those similar subjects, and a regression is therefore performed using both dimensions.

According to Hsiao and Mountain (1995), this mixture involving cross-sectional together with time series data typically permits greater levels of freedom under the estimating process. It also offers the benefit of involving specific-country consequences, providing so much details as well as limiting multi-collinearity between independent variables, thus improving the accuracy of econometrics projections. Furthermore, panel data offers a way in resolving the immensity of econometric issues which frequently occur during empirical investigations, specifically the widely repeated claim that the existence of missing variables which are linked to the independent variables is the basis on why specific consequences are found (Gujarati, 2004). Moreover, panel data sets enable researchers to examine a variety of crucial economic issues which both time-series and cross-sectional data are unable to. Fourthly, using panel data helps reduce biases which could arise from grouping people or nations in large aggregates. Lastly, panel data is more suitable for studying changes in dynamics and also for identifying and measuring effects which are indistinguishable from those seen under pure time-series or cross-sectional data (Gujarati,

2004). Whenever we think that the output variable relies upon independent factors that are not visible and yet are associated with observed independent variable, panel data set is more helpful.

3.2 Theoretical framework

Due to the crucial significance that capital plays in the growth of some nations, such nations frequently have capital shortages and must borrow money from elsewhere. A specific amount of investments as well as savings is necessary for a nation to achieve sustainable growth, also in the scenario of several SSA nations where it seems insufficient, it leads to foreign indebtedness. The gap hypothesis idea is useful in this situation. According to Chenery and Strout's (1966) dual-gap hypothesis, in order for growth to occur, investments are required, and investments are a result of savings. Since national savings are relatively insufficient, investments that depends upon them is insufficient to guarantee that development occurs in the SSA region.

The framework for the dual-gap is based upon the idea that the excess of importation over exporting is comparable to the surpluses of capital investments over household savings. As a result, the accompanying equations are true in equilibrium:

$$INVESTMENTS - SAVINGS = IMPORTS - EXPORTS \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots. (FOUR)$$

$$SAVINGS - IMPORTS = EXPORTS - IMPORTS \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots. (FIVE)$$

According to the above equating (**FOUR**), local resource-gap ($\boldsymbol{Savings - Investments}$) is **t**he same as external exchange-gap ($\boldsymbol{Exports - Imports}$)**,** a surplus of imported resources over resources produced by them. The above also suggests further that the ratio of investments to local savings determines the requirement for having to borrow abroad over-time.

3.3 Model estimation

 Economic-model refers to the representation of the actual world that shows the fundamental characteristics about an economic phenomenon (Fonta et al., 2009). A number of the research's variable(s) have previously been mentioned under the second chapter under empirical and theoretical evaluation. This model is based upon a straightforward open-macroeconomic-debt-

growth concept used by Boboye and Ojo (2012). The mathematical expression of Boboye's model stated as follows:

$Real\ Gross\ Domestic\ Product\ Growth\ Rate =$
$f(External\ Debt\ Stocks, External, Debt\ Service\ Payment, Exchange\ Rate)$............(SIX)

Economic Model

The author modifies a Siddique et al. (2015) model that has these following details:

$$GDP = \propto + \beta_1 KF_{it} + \beta_2 ED_{it} + \beta_3 TD_{it} + \beta_4 GP_{it} + \varepsilon_{it} .... \text{(SEVEN)}$$

Where, KF stands for Capital Formation.

    ED stands for External Debt.

    TD stands for Trade.

    GP stands for Population Growth.

    ε stands for the error term

Below is how the econometric technique employed in this research is structured:

$$GDP = \propto + \beta_1 EDSck_{it} + \beta_2 DSPn_{it} + \beta_3 PG_{it} + \beta_4 DI_{it} + \beta_5 C_{it} + \varepsilon_{it} \ .... \text{(EIGHT)}$$

Where $\propto$ is a constant for the regression.

    $\beta's$ denotes this model's estimated coefficients

GDP denotes Gross domestic Product.

EDSck denotes External Debt Stock.

PG denotes Population Growth.

DI denotes Domestic Investments.

C is Corruption.

3.4 Measurement and justification of the variables

The appropriate variables for the model are given by the empirical as well as theoretical review of the literature discussed over the preceding chapters. Under this part, the explained and explanatory variables are both validated.

GDP growth rate

This variable, which is dependent, calculates the percentage change in the economy from one time onto the next. It gauges how quickly GDP fluctuates from one time frame onto the next. The GDP growth rate seems to be a crucial element of economies since it reveals the direction as well as pace of the economy's expansion. It gauges how quickly the economy is expanding. Any rising GDP growth rate indicates a rising economy, whereas a falling growth rate indicates a depressed economy. Eligayehu (2013) similarly employed the exact variable.

External Debt Stock

Under this research, the overall stock of debt to GDP is used to calculate the foreign debt stock using percentages terms. This variable, which measures the effect of accumulated debt upon growth of the economy, serves as the research 's key independent variable. This variable was also employed in researches by Iyoha (1999) , Siddique (2015), as well as Pattillo (2002) and found a statistically relevant link between foreign debt and growth. Based on theory, this variable is predicted to have a negative coefficient.

External Debt Service payment

Service of External Debt Payment, measured as a percentage,, is the sum utilized to pay down the foreign debt. It serves as a stand-in when measuring the burden of debt. The basic assumption

would be that the growth of an economy would decrease as debt servicing costs increase. According to Oryema (2009), depending upon whether the crowding-in or crowding-out impact predominates, the predicted sign of foreign debt service payments as a percentage of GDP could be a minus or plus. The consequence for this repayment of debt (interest + principal) is to divert funds from investments. When investments decrease due to debt servicing, economic growth logically follows. This variable's predicted sign might be negative or positive.

Population Growth

The population size's yearly growth rate is used to calculate this variable. According to neoclassical theory, population expansion stimulates growth of an economy. Theoretical literature has demonstrated that population expansion is a barrier to growth in the economy. In contrast, greater markets for effective innovations are implied by increasing population as well as labour; as a result, growth in population promotes greater productiveness through greater percentages of innovations.
Siddique (2015) utilized such variable but also suggested that population expansion will have a p ositive effect upon GDP, maybe as a result of a rise in human capital or labourforce.

Domestic investment

Gross Fixed Capital Formation serves as a proxy for domestic investments. It reflects investment made within the nation. A rise in capital creation translates into a higher level of output production. Therefore, a rise in total fixed-capital creation will spur aggregate demand, that then would encourage economic expansion. Iyoha (1999) utilised domestic investment as well. Investments boost growth of the economy, in line with Solow-growth model. He provided a formula for the accumulation of capital to illustrate this, where he showed how a rise in capital creation leads to economic expansion. A priori, it is anticipated that this variable's sign will be positive.

Corruption (Dummy variable)

The most significant index for measuring corruption is the Worldwide Governance Indicators, particularly its dimension on corruption (CCI), which is released yearly by World Bank and

provides an assessment of the extent of corruption in different nations. Both 'sand the wheels' and 'grease the wheels' are two hypotheses that explain how corruption as well as the growth of an economy are related. Conforming to sand the wheels theory, growth in the economy can be adversely affected by corruption. According to Rose-Ackerman (1978), it is challenging to reduce corruption in places with economic circumstances. Shleifer and Vishny (1993) assert that corruption hinders growth in the economy. The "grease the wheels" concept, conversely, contends that corruption can have a beneficial effect on economic development. According to Summers (1977), corruption favourably impacts growth because it avoids bureaucratic system as well as motivating corrupted government officials to function extra effectively. Several scholars have theorized that corruption has a detrimental impact on economic growth, demonstrating the adverse nature of such impact (Ivanyna et al., 2016). Moreso, this dummy variable and foreign-debt will form an interaction term so as to help understand how corruption and foreign-debt influences growth in the economy under the SSA region.

3.5 Research Instruments

Three techniques are typically used for panel data regression: the Fixed Effect Model, the Random Effect Model, as well as the straightforward Ordinary Least Squares model. This research was predicated upon the supposition that there was a link connecting error element as well as the Hausman testing, allowing one to select the most appropriate model to utilize. The alternative way for determining which model fits better through comparing the usage of FEM and REM is the Chi-squared distributions. Breusch-Pagan Lagrange Multiplier test is the alternative approach for selecting among a straightforward OLS model and a REM. The optimal model to employ when studying the impact of foreign debt upon the economy's expansion for SSA is determined using LM test as well as Hausman testing. According to the Hausman test, fixed effect model is the ideal one to use when Chi-square likelihood is below 5% while random effect technique is favoured when the likelihood is above 5%. Based upon the LM test, chi-squared probability must be above 5% in order for the OLS model to outperform the REM. Conversely, if the chi-squared likelihood is below 5%, the REM would then be chosen.

Random effects model (REM)

Once the individual-specific effects in a REM is mutually independent with the predictors, it is referred to be a random variable (Kurt, 2014). This model takes the unconnected effects (E(Ci/ Xi, zi) =0) as given. The reasoning underlying the REM is that, in contrast to a FEM, it assumes that changes between individuals are random as well as unrelated to the predictor variables which are part of the model. The following details the Random Effects Model:

$$Y = \propto + \beta_{it} + \varepsilon_{it} + \mu_{it}$$

The aforementioned formula is predicated upon the idea in which the individual's specific impact is a random variable which is unrelated to the predictor factors, regardless of whether they are for the previous, present, or futures of the exact individual. The approach makes the assumption that each person has distinctive time-constant characteristics which are similar to the outcomes of random fluctuations as well as not interact with specific regression.

Fixed Effects Model

FEM is described as a statistical approach, if the detected quantities are interpreted as though they are non-random with respect to the predictor factors. The factors are permitted to interact with the predictor variables within a FEM. In this approach, people have distinctive characteristics that aren't the consequence of random fluctuations as well as not changing over-time. By using intercept values, they allow for variability or individuality between nations.

Testing Fixed and Random Effects Models (Hausman Test)

Under panel data survey, Hausman testing is employed to determine whether the FEM or the REM is more appropriate. Another of the Gauss-Markov hypotheses is broken by a REM that yields biased approximations when connected. The key finding of this test is that an efficient estimate has zero correlation regarding its divergence out of an ineffective estimation (Greene, 2003). In order to derive inferences from the aforementioned assumption, likelihood levels are employed, thus when p-value is below 5%, H0 is rejected.

Testing Ordinary Least Squares vs. Random Effects (Breusch and Pagan Lagrangian Multiplier

The OLS error-term serve as the foundation for this test. It examines the relationship between expected variances of the error-term from regression and the quantities of the predictor factors. OLS would be a superior choice to use compared to REM when the chi-squared probability is over 5%; nevertheless, when its p-value is below 5%, the REM will be the most appropriate to use.

3.6 Sources of Data

Using a group of thirty SSA nations from 2002 up to 2020, the effect of foreign-debt upon growth in an economy was estimated using secondary panel data. The World Bank Development Indicators was employed to get the data (World Bank, 2020).

3.7 Stata package

Stata package offers a thorough foundation of numerical economic procedures, including how models are created, the hypotheses that underlie them, as well as how parameter estimations and various economic variables are calculated. This investigator employs Stata system as a statistical tool primarily employed to analyse panel data, to simulate the statistics.

3.8 Summary

The technique as well as model specifications utilized for the assessment of this research were described throughout chapter three. A number of refinement tests likewise have been emphasized, and the variables employed have been justified. The remainder of the fourth chapter then concentrates upon the estimating as well as presentation of data gathered using Stata 15 program.

CHAPTER FOUR

ESTIMATIONS PRESENTATION AND INTERPRETATION OF RESULTS

4.0 Introduction

Estimation outcomes from the impact of public external debt on economic growth in Sub Saharan Africa is presented, examined and discussed in this chapter. This observed study customs yearly information for thirty SSA countries intended for a period of nineteen years thus, (2002- 2020). Furthermore, clarification of the attained outcomes from software 15 of Stata

4.1Descriptive statistics

In this section, the main focus is studying the procedure of central tendency and also the speeding of the data. In other words, it studies the standard deviation; mean; minimum and maximum figures of the overall forty-eight countries in the SSA region, this study focuses on 30 countries for the period of (2002- 2020) because of the absence of information in some states for other variables involved in this study. Below are **tables** showing a summary of descriptive statistics of the predictor and dependent variables respectively.

Table 1 Descriptive Statistics for Predictor Variables

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
External Debt Stock	570	44.17	29.91	3.895	175.8
External Debt S. Payment	570	2.837	4.324	0.0529	45.12
Population Growth	570	2.559	0.785	0.00229	4.630
Domestic Investment	570	21.53	7.854	2.000	59.72
Corruption	570	-0.725	0.580	-1.575	1.245

Table 2: Descriptive Statistics for the Dependent Variable

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Economic growth	570	4.143	4.939	-36.39	33.63

4.3 Multicollinearity analysis

In order to inspect Multicollinearity, a correlation matrix is performed. The collinearity implies that variables act in an orderly path with each other. The decision rule under the pair correlation matrix is that when there is an absolute result which is more than 0.8, this implies that there is existence of a consequential Multicollinearity. **Appendix** shows the outcomes for the test which displays absence of sincere Multicollinearity among the variables since all the values are smaller than the absolute value of 0.8

4.4 ESTIMATIONS

4.4.1 Random effects versus Fixed effects

The table below illustrate outcomes attained from Random effect and Fixed effect models which were regressed to observe the question in study thus, impact of public external debt on economic growth in sub–Saharan Africa for thirty countries in this region for a period of nineteen years (2002- 2020). Outcomes were established using software 15 of Stata

Table 3: Fixed vs Random

VARIABLES	(1) fixed effects	(2) random effects
External Debt Stock	-0.030***	-0.024***
	(0.008)	(0.008)
Debt service Payment	-0.032	0.048
	(0.083)	(0.062)
Population Growth	4.926***	2.213***
	(0.665)	(0.372)
Domestic Investment	0.092**	0.058*
	(0.037)	(0.030)
Corruption	0.006	1.045**
	(0.999)	(0.485)
Constant	-9.033***	-1.087
	(2.076)	(1.134)
Observations	570	570
R-squared	0.139	
Number of id	30	30

Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

4.4.2 The Hausman Test

In order to know the best suiting model between fixed effects and random effects we run the Hausman test. Under this test, the null hypothesis states that panel data match up to random model. Test results of the test are seen in the appendix and they are concluding that Ho is denied giving backing to Ha thus, the best suiting model for this panel data is fixed effect.

Breusch-Pagan Lagrangian Multiplier (BPLM)

By caution, it is necessary to test the presence of random effects by using the BPLM which assist in choosing among Random effect model and pooled OLS model. The outcome of the probability is shown in **APPENDIX 6** which is 0.0016 which is smaller than the five percent level of significance thus, making random effects the most suitable.

As the Hausman test has eliminated Random effects model, and Lagrangian Multiplier has refused pooled OLS model, we then select with confidence *the fixed effects model* and tests for heteroskedasticity of the model. For this study, the existence of heteroskedasticity was tested

through the Breusch- Pagan test. The results of the test are shown in **APPENDIX 7** rejecting the Ho which states that there is absence of heteroskedasticity at one percent level

4.4.3 Robust fixed effect model

The existence of heteroskedasticity in the fixed effect model can be corrected by the use of robust fixed effect model which produced the final regression results of the data set for the impact of public external debt on economic growth in sub–Saharan African region.

Table 4: Regression results in presence of the interaction term

VARIABLES	(1) Robust fixed effects
EDS * Corruption	0.016
	(0.014)
Domestic Investment	0.097**
	(0.044)
Population Growth	4.899***
	(1.081)
External Debt S. Payment	-0.096
	(0.101)
Constant	-9.678***
	(3.209)
Observations	570
Number of id	30
R-squared	0.125

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Regression results in absence of the interaction term

VARIABLES	(1) robust fixed effects
External Debt Stock	-0.030**
	(0.013)
External Debt S Payment	-0.032
	(0.108)
Population Growth	4.926***
	(1.056)
Domestic Investment	0.092**
	(0.043)
Corruption	0.006
	(1.654)
Constant	-9.033**
	(3.564)
Observations	570
Number of id	30
R-squared	0.139

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4.4.4 Interpretation of results in absence of the interaction term

The estimation of this study thus, 'the impact of public external debt on economic growth in SSA' was concluded using Robust fixed effects model as shown in the above regression table. The approximated regression equation by the Robust fixed effect model is:

$$GDP = -9.033 - 0.030 External\ Debt\ Stock_{it}$$
$$- 0.032 External\ Debt\ Service\ Payment_{it}$$
$$+ 4.926 Population\ Growth_{it} + 0.092 Domestic\ Investment_{it}$$
$$+ 0.006 Corruption_{it}$$

From the above equation it can be concluded that all the independent variables are statistically important in the amplifying of this model excluding corruption and external debt service payments.

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External Debt as a fraction of GDP

The Main independent variable is statistically non-zero and this implies its significance in explaining the dependent variable thus, GDP. The result of the coefficient and the significance of debt stock to Gross domestic product is of great attention because it responds to the main objective of this research. As illustrated by the model above, external debt stock has a negative statistically relevant impact on economic growth thus, as external debt stock rises by a single unit the GDP then decrease by 0.030 unit. The outcomes attained in this study are matching debt overhang hypothesis (Krugman,1989), which alludes that the huge debt burden of a nation is acquired when debt stock is more than the nation's serving capacity resulting in investments discouragement.

Domestic Investment

The level GDP would grow by 0.092 for every increment in the domestic investment as a percentage of GDP. There is modest correlation among domestic investment and the growth of the economy in SSA since fluctuations in domestic investments are relevant at ten percent degree in determining Gross Domestic Product. The decrease in GDP is primarily caused by the fact that the funds available for economic expansion are actually decreased as a result of an outflow of investments domestically.

Population growth

From the outcomes of the model, it can be seen that population growth variable has a positive coefficient sign and it is highly significant in explaining the dependent variable thus, economic growth for SSA. In addition, there is a direct relationship between population growth and economic growth thus, a population surge by a single unit will result in a 4.292 rise in economic growth. This relationship might be because the rise in population growth result in a relatively high Labor force.

4.5 Summary

The findings concluded that external debt has a detrimental impact on economic growth. However, it was discovered that population increase and domestic investment were correlated with economic growth; as a result, policies that encourage investment must be put into place in order to stimulate growth. On the other hand, it was discovered that external debt service

payment and corruption were statistically insignificant in explaining economic growth in the region of SSA. Results from the Stata 15 software used in the analysis of the data have been provided and discussed in this chapter. The Recommendation considering future policies and study will be revealed under the following chapter.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

Using the Robust Fixed Effect Model for regression analysis of panel data, this research examined the impact of public foreign debt upon growth for thirty SSA nations from 2002 UP to 2020. Chapter five offers a synopsis of the research along with suggestions as well as policy ramifications based upon the empirical data. There is a list of this research's drawbacks and recommendations for additional investigation topics.

5.1 Summary

The goal of this study was to use panel data analyses in examine impact of foreign-debt upon growth in an economy for SSA nations during a nineteen-year timeframe, between 2002 and 2020. This research's findings, shows that foreign debt has an adverse effect upon growth, appear to support debt-overhang concept. Nevertheless, growth is positively correlated with increasing population, debt service payments, corruption as well as domestic investments.

5.2 Conclusion

This research actually investigates, for a sample of thirty SSA nations, how foreign-debt affects economic growth. This study's findings confirmed the conjecture (H0) , which holds that there is no correlation connecting external debt with economic expansion. The findings show that the debt-overhang that appears to be common within this area is the major cause of the Sub-Saharan Africa's slow economic growth.

Due to the significant resources that would be devoted to debt payment, domestic investments will be extremely limited. As a result, a portion of the earnings from domestic investments are essentially taxed off, discouraging future investors.

Economic growth is positively impacted by population expansion. A higher labour force in the manufacturing sector results from a growing population, necessitating increased human-capital. As a result of the enhanced productiveness in the manufacturing industries, there will be an expansion of the economy.

5.3 Recommendations

   Considering achieving long-term economic-growth as the primary goal of most states, the administrations of SSA nations must develop beneficial policies that boost sectors since doing so would result in higher job percentages plus a rise in productiveness that fosters growth. Sub-Saharan African nations must establish steps to guarantee a successful utilisation of borrowed money, primarily to deploy such money towards the goal that they have been obtained for, in order to minimize foreign debt stock, that appears to have an adverse influence upon growth. It's inappropriate to spend such borrowed money towards political or social objectives. This is all intended to prevent the stock of foreign debt from rising over time. Possible prerequisites for SSA's growth as well as development include debt relief, that should extend above debt rescheduling. Regarding lower income SSA nations, it may be a legislative program which merges debt reduction (debt servicing write-downs) alongside a sizable level of debt-forgiveness

In addition to handling borrowed funds responsibly, such SSA nations must adopt useful as well as effectual external debt managing system that should force nations to settle their obligations immediately upon maturity. In order to prevent a debt-overhang, the administrations responsible for administering the area's foreign debt in such SSA nations must maintain appropriate monitoring of debt payments commitments. To prevent the problem of mounting debt, the above is conducted.

5.4 Suggested areas for further study

Only the effect of foreign debt upon growth was the subject of this research. Future research might expand this topic by examining the causation between debt and economic expansion. This results from the possibility of changeable correlation but not causal connection. Therefore, understanding the causal relationship is essential for further research. The factors that influence foreign debt within SSA region require more study. Future research should concentrate on determining how externally obtained loans are used as well as how they affect economic growth. As an example, one may research how foreign borrowing for the manufacturing sector affects economic expansion.

There is still need for more research into how foreign debt affects economic growth. It is possible to do more research for the assessment of external debt control solutions that SSA countries might use to increase the likelihood of growth for their economies.

Though it wasn't included within this study owing to a lack of data, informal industry employment also contributes significantly to the creation of a country's output and, consequently, towards economic development. Therefore, it is necessary to add the variable plus the employment of labor.

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APPENDIX *A* Raw data

year	country	Economic growth	External Debt Stock	Domestic Payment	Population Growth	Domestic Investment	Corruption
2002	Angola	13.66569	66.80154	10.62272	3.329262	30.32665	-1.15549
2003	Angola	2.99	56.66089	9.254737	3.378794	29.67478	-1.33546
2004	Angola	10.95	46.53166	8.94788	3.452988	30.60774	-1.37757
2005	Angola	15.03	37.1535	7.937079	3.537605	27.79225	-1.32318
2006	Angola	11.55	21.43833	9.586005	3.619584	21.94765	-1.24104
2007	Angola	14.01	20.70806	7.795289	3.680601	25.15585	-1.30749
2008	Angola	11.17	20.84443	2.18486	3.710555	29.21997	-1.30876
2009	Angola	0.86	31.94076	6.350636	3.703842	42.79249	-1.39777
2010	Angola	4.86	35.39115	4.012184	3.671493	28.2365	-1.33247
2011	Angola	3.47	33.66611	3.958776	3.63415	26.3924	-1.36747
2012	Angola	8.54	31.3321	5.157965	3.597755	26.68084	-1.3024
2013	Angola	4.95	34.75505	4.642637	3.551997	26.1585	-1.33687
2014	Angola	4.82	33.94364	6.190152	3.497447	27.47881	-1.4578
2015	Angola	0.94	44.66033	10.20293	3.438869	28.20961	-1.40927
2016	Angola	-2.58	60.33097	23.19904	3.378269	26.21321	-1.46788
2017	Angola	-0.15	51.62871	14.12911	3.322158	23.24232	-1.42805
2018	Angola	-1.31631	67.59521	15.38841	3.276145	17.1947	-1.1805
2019	Angola	-0.7	78.68798	18.457	3.242914	16.23756	-1.07811
2020	Angola	-5.5	125.8827	17.22174	3.21853	16.02851	-0.95337
2002	Benin	4.643031	38.82232	1.373564	3.043236	16.91268	-0.79571
2003	Benin	3.443577	27.939	0.948349	3.039606	17.54336	-0.57758
2004	Benin	4.429685	26.29631	0.667566	3.005316	16.08666	-0.56302
2005	Benin	1.713165	23.78363	0.739573	2.952371	15.04109	-0.87133
2006	Benin	3.943739	9.426076	0.600007	2.897521	14.16144	-0.5871
2007	Benin	5.986349	11.11598	0.452833	2.854099	17.05747	-0.47014
2008	Benin	4.896577	10.21012	0.308254	2.823522	15.84501	-0.51408
2009	Benin	2.319292	13.65552	0.491257	2.809427	16.56555	-0.62727
2010	Benin	2.114065	16.83749	0.462214	2.805976	17.65	-0.66538
2011	Benin	2.963753	17.46063	0.470247	2.803762	18.22633	-0.60545
2012	Benin	4.811223	15.10829	0.530949	2.797721	16.20403	-0.85792
2013	Benin	7.191434	16.05396	0.677517	2.790716	20.70826	-0.74544
2014	Benin	6.357679	15.43943	0.604114	2.782092	21.63766	-0.66914
2015	Benin	1.778151	19.21785	0.692155	2.771838	20.49574	-0.53436
2016	Benin	3.339673	19.26955	0.841773	2.761361	19.72249	-0.50119
2017	Benin	5.671555	22.24622	0.828445	2.749902	23.43845	-0.54961

2018	Benin	6.697259	25.42149	1.640617	2.734856	25.90056	-0.36831
2019	Benin	6.865687	27.21575	3.607608	2.715219	25.17326	-0.31778
2020	Benin	3.848792	33.89847	1.864338	2.692374	25.20652	-0.03325
2002	Botswana	6.069531	10.36457	1.279997	1.773367	27.4724	0.624538
2003	Botswana	4.625895	7.565283	0.741303	1.730185	28.01585	1.24492
2004	Botswana	2.705822	6.449163	0.607625	1.779859	27.84177	0.875726
2005	Botswana	4.556646	5.06958	0.589398	1.882113	25.33981	1.160793
2006	Botswana	8.363871	3.895006	0.601651	2.026706	26.20105	0.936531
2007	Botswana	8.276764	4.168161	0.462923	2.131208	28.38526	0.993911
2008	Botswana	6.245437	4.398759	0.683374	2.119679	30.58264	1.02253
2009	Botswana	-7.65231	16.3853	0.465663	1.957039	34.90966	0.927734
2010	Botswana	8.563631	14.87522	0.65487	1.705923	33.61618	1.003351
2011	Botswana	6.048361	15.95078	0.528795	1.414136	32.04485	0.966567
2012	Botswana	4.456144	17.83583	0.4179	1.190902	36.22768	0.906515
2013	Botswana	11.3434	16.75848	1.360195	1.121388	33.49769	0.893463
2014	Botswana	4.149262	15.86365	0.42662	1.255952	25.13553	0.81304
2015	Botswana	-5.71768	16.14982	1.889198	1.525069	27.00743	0.813295
2016	Botswana	7.036897	13.93057	1.222697	1.831973	24.51918	0.900316
2017	Botswana	4.00345	10.69187	1.197617	2.068848	24.20433	0.744532
2018	Botswana	3.980395	10.49999	1.206586	2.197416	26.57709	0.749112
2019	Botswana	3.34891	9.46634	1.244791	2.178169	28.90137	0.702542
2020	Botswana	-8.72641	10.58309	1.248116	2.058875	28.17392	0.62928
2002	Burundi	4.446519	151.805	2.915627	2.699734	3.94866	-0.7599
2003	Burundi	-1.22373	175.8492	3.860045	3.012625	7.86879	-0.87415
2004	Burundi	4.833658	152.9279	9.950907	3.169974	10.3471	-0.9784
2005	Burundi	0.9	117.1437	3.639247	3.217168	18.3	-0.95718
2006	Burundi	5.413807	108.4872	1.579365	3.246098	17.21299	-1.1015
2007	Burundi	3.451952	104.4013	1.34779	3.288916	14.78646	-1.16698
2008	Burundi	4.861713	86.48571	1.221154	3.301182	13.30896	-1.08823
2009	Burundi	3.812747	34.4146	1.125939	3.287162	18.37487	-1.13256
2010	Burundi	5.124158	30.71856	0.216432	3.256196	16.46038	-1.1689
2011	Burundi	4.0326	27.24557	0.461078	3.207713	15.44575	-1.20837
2012	Burundi	4.446706	28.67962	0.90236	3.159785	14.83817	-1.46861
2013	Burundi	4.92419	27.86346	1.318005	3.133498	13.43263	-1.42611
2014	Burundi	4.24065	25.57127	1.120953	3.136757	14.40306	-1.26783
2015	Burundi	-3.9	20.17509	0.867539	3.156908	12.32608	-1.26648
2016	Burundi	-0.6	22.06328	1.266271	3.177015	9.403651	-1.26035
2017	Burundi	0.500001	22.11427	1.000111	3.1812	8.984055	-1.30445
2018	Burundi	1.609935	21.87757	1.124656	3.166912	11.10344	-1.45979
2019	Burundi	1.812565	22.51519	1.535431	3.128932	14.12871	-1.48039
2020	Burundi	0.327157	21.91571	1.291132	3.076102	11.44597	-1.54402

2002	Cameroon	4.477027	87.60486	2.981009	2.655723	19.5149	-1.20911
2003	Cameroon	5.453154	73.87	2.82701	2.673768	18.36332	-0.98134
2004	Cameroon	7.048863	58.92579	3.33114	2.692179	18.89102	-1.12544
2005	Cameroon	2.22827	40.48221	4.305136	2.709791	18.58028	-1.19941
2006	Cameroon	3.809583	16.54818	3.626586	2.727136	17.85568	-1.09146
2007	Cameroon	4.327589	13.17079	2.075042	2.741994	18.58305	-1.03304
2008	Cameroon	2.847678	10.38631	1.603972	2.750833	19.89581	-1.03423
2009	Cameroon	2.579252	11.63716	1.446119	2.752286	18.59924	-1.02055
2010	Cameroon	2.899025	11.70998	0.74563	2.747734	18.52584	-1.07532
2011	Cameroon	3.379211	10.20373	1.094089	2.740479	18.93489	-1.16693
2012	Cameroon	4.625979	13.08634	0.798865	2.731249	18.19666	-1.27244
2013	Cameroon	4.995529	15.63919	0.828118	2.718249	18.39354	-1.21758
2014	Cameroon	5.719818	15.9725	1.470158	2.701525	19.43691	-1.17845
2015	Cameroon	5.666953	22.99068	1.601853	2.681848	18.61178	-1.07416
2016	Cameroon	4.535794	23.7259	2.597733	2.660502	19.45761	-1.15826
2017	Cameroon	3.541177	28.42549	2.034025	2.637754	19.29614	-1.20552
2018	Cameroon	3.955514	27.84788	2.706304	2.612284	19.55004	-1.14411
2019	Cameroon	3.47506	33.09325	2.942797	2.584179	19.08851	-1.19402
2020	Cameroon	0.491915	34.72909	3.115757	2.55431	17.84801	-1.11479
2002	Central African Republic	3.616542	110.309	0.118809	2.129572	9.624947	-0.97982
2003	Central African Republic	-5.39749	93.60376	0.070957	2.057935	6.404793	-1.02073
2004	Central African Republic	5.994884	88.89304	0.854022	2.007396	6.812138	-1.47727
2005	Central African Republic	0.908211	78.72405	0.518084	1.962914	9.864817	-1.30277
2006	Central African Republic	4.771085	72.39731	4.918997	1.95422	10.23421	-1.21914
2007	Central African Republic	4.607535	61.05137	5.319119	1.922335	10.68724	-1.21095
2008	Central African Republic	2.054131	50.89325	1.368068	1.77931	12.72839	-1.13728
2009	Central African Republic	8.58726	26.81675	1.522202	1.492423	12.92174	-0.98885
2010	Central African Republic	4.630818	29.47239	0.156044	1.126555	16.13642	-0.93761
2011	Central African Republic	4.194615	23.33541	0.061478	0.723968	13.4134	-0.96754
2012	Central African Republic	5.053761	22.89208	0.18403	0.401399	10.7696	-1.00553
2013	Central African Republic	-36.392	35.01507	0.392563	0.259648	6.349849	-1.09623
2014	Central African Republic	0.081071	34.55656	0.629439	0.364134	21.15591	-1.16635
2015	Central African Republic	4.337121	42.53615	1.023292	0.647516	20.57278	-1.29905
2016	Central African Republic	4.750317	39.79905	1.366658	0.985784	20.87764	-1.28009
2017	Central African Republic	4.527278	35.02218	1.821445	1.277483	24.23803	-1.17621
2018	Central African Republic	3.789444	34.56466	1.134715	1.519117	16.39798	-1.21337
2019	Central African Republic	3.1	37.1994	1.32746	1.674662	14.38813	-1.21617
2020	Central African Republic	0.9	38.08347	0.699942	1.766845	18.29877	-1.27466
2002	Chad	8.49121	65.8772	1.4175	3.856179	59.72307	-1.27031
2003	Chad	14.72167	67.38916	1.802375	3.85721	48.60098	-1.46501
2004	Chad	33.62937	44.33045	1.051405	3.777247	22.74036	-1.44835

2005	Chad	17.33253	28.97461	0.97067	3.649862	20.59184	-1.53199
2006	Chad	0.648262	28.26702	0.919407	3.508157	22.00553	-1.36101
2007	Chad	3.2715	24.81395	0.92086	3.3931	21.3826	-1.38899
2008	Chad	3.052692	20.65863	1.57353	3.323316	21.30595	-1.53419
2009	Chad	4.217696	21.05155	0.872586	3.311571	29.41672	-1.41218
2010	Chad	13.5501	20.92195	0.70927	3.334669	33.62211	-1.39424
2011	Chad	0.08287	19.66383	0.698391	3.363538	28.28037	-1.35516
2012	Chad	8.882576	19.44514	0.691476	3.370768	31.10026	-1.331
2013	Chad	5.700001	23.54369	0.971389	3.351069	28.58269	-1.37011
2014	Chad	6.899985	27.92567	4.418938	3.296899	33.17319	-1.32901
2015	Chad	2.767676	26.42586	0.971334	3.222	27.81497	-1.35365
2016	Chad	-6.25553	28.92848	1.526175	3.143933	23.6436	-1.48463
2017	Chad	-2.9887	31.65195	1.85595	3.077507	20.53762	-1.43387
2018	Chad	2.374038	29.27886	0.933233	3.023505	20.86751	-1.38596
2019	Chad	3.247182	29.73887	0.799937	2.98613	21.41343	-1.40078
2020	Chad	-1.60001	36.73316	1.143982	2.959354	20.55508	-1.40585
2002	Comoros	2.324945	63.62465	1.110109	2.414424	17.11644	-0.67477
2003	Comoros	2.103872	53.15754	0.559953	2.382881	17.11645	-0.69381
2004	Comoros	1.91966	48.17785	0.523648	2.374983	17.11646	-0.86425
2005	Comoros	2.837548	44.25564	0.618261	2.381705	17.11644	-0.88724
2006	Comoros	2.646955	42.09854	0.538948	2.39129	17.11646	-0.70017
2007	Comoros	0.800042	36.08357	3.283069	2.397022	16.01074	-0.69156
2008	Comoros	3.964611	30.22318	1.353302	2.402701	18.6945	-0.77249
2009	Comoros	3.240741	31.71861	1.312488	2.408875	16.64412	-0.81259
2010	Comoros	3.777767	30.68742	0.473887	2.41327	17.86245	-0.78625
2011	Comoros	4.143507	26.97111	0.385508	2.418268	16.72723	-0.80392
2012	Comoros	3.16841	24.88092	1.21427	2.417131	16.69606	-0.78155
2013	Comoros	4.466247	13.21443	0.05295	2.408509	16.21638	-0.73178
2014	Comoros	2.106658	12.31462	0.067966	2.382548	15.2375	-0.58659
2015	Comoros	1.147351	13.46171	0.770563	2.348456	13.49633	-0.74438
2016	Comoros	3.320447	17.67514	0.63071	2.309274	12.47559	-0.68501
2017	Comoros	3.815763	17.2243	0.374148	2.273245	13.32326	-0.68502
2018	Comoros	3.642451	20.66781	0.518747	2.239416	14.75946	-0.82552
2019	Comoros	1.760786	22.68918	0.372967	2.206465	12.62817	-1.03628
2020	Comoros	-0.29305	24.53635	0.663618	2.174355	11.0022	-1.1842
2002	Congo, Dem. Rep.	2.947765	119.2315	11.01903	2.936392	7.428933	-1.44997
2003	Congo, Dem. Rep.	5.577822	131.2548	1.701656	3.068267	9.424784	-1.52646
2004	Congo, Dem. Rep.	6.738374	115.3652	1.333786	3.145471	12.14211	-1.44469
2005	Congo, Dem. Rep.	6.135151	93.25277	1.899683	3.184227	11.67611	-1.44338
2006	Congo, Dem. Rep.	5.32098	81.00506	2.071549	3.218828	14.58487	-1.54051
2007	Congo, Dem. Rep.	6.259478	77.37415	3.110134	3.261374	13.61244	-1.38107

2008	Congo, Dem. Rep.	6.225894	66.616	3.207983	3.293967	10.74621	-1.26119
2009	Congo, Dem. Rep.	2.855064	73.29871	3.496242	3.316893	14.49307	-1.41293
2010	Congo, Dem. Rep.	7.107977	29.71029	1.328536	3.331133	28.72191	-1.45789
2011	Congo, Dem. Rep.	6.874671	22.3023	1.040567	3.337676	24.81535	-1.45751
2012	Congo, Dem. Rep.	7.086899	20.26612	1.007051	3.337571	14.24797	-1.32971
2013	Congo, Dem. Rep.	8.481957	20.53149	1.342471	3.331356	21.7392	-1.33808
2014	Congo, Dem. Rep.	9.470288	16.67795	1.249769	3.319678	23.11103	-1.32077
2015	Congo, Dem. Rep.	6.916167	15.16779	1.129493	3.302819	21.58564	-1.29126
2016	Congo, Dem. Rep.	2.399399	13.81625	1.33158	3.282934	19.93174	-1.34875
2017	Congo, Dem. Rep.	3.726948	13.76047	1.071595	3.258506	24.77374	-1.42862
2018	Congo, Dem. Rep.	5.821121	10.8051	0.820582	3.226699	20.39247	-1.50056
2019	Congo, Dem. Rep.	4.384529	11.47395	2.240699	3.187086	20.33975	-1.53987
2020	Congo, Dem. Rep.	1.735423	12.93574	0.687572	3.142652	24.27666	-1.57468
2002	Cote d'Ivoire	-2.73053	107.8376	7.653064	2.221108	15.45886	-0.80153
2003	Cote d'Ivoire	-4.72587	89.52638	4.375768	2.113555	12.84385	-1.01384
2004	Cote d'Ivoire	3.185038	89.10885	2.64964	2.085422	13.49333	-1.24132
2005	Cote d'Ivoire	0.996066	73.06041	1.868132	2.114435	13.73747	-1.24979
2006	Cote d'Ivoire	2.815579	79.75934	1.57866	2.158031	14.24364	-1.20753
2007	Cote d'Ivoire	1.10143	73.54087	2.204686	2.195596	16.69715	-1.09507
2008	Cote d'Ivoire	4.782666	55.36615	4.47458	2.240185	16.11778	-1.11905
2009	Cote d'Ivoire	3.603322	63.55768	4.834653	2.287165	16.10816	-1.11739
2010	Cote d'Ivoire	6.848049	48.77324	3.131443	2.334536	20.70317	-1.17285
2011	Cote d'Ivoire	-5.37045	52.36803	2.992766	2.385527	17.84706	-1.03099
2012	Cote d'Ivoire	7.620412	36.80848	2.778103	2.435943	17.11227	-0.83851
2013	Cote d'Ivoire	10.76021	33.00299	3.528038	2.476679	20.7312	-0.73994
2014	Cote d'Ivoire	9.372	28.46042	2.105767	2.504496	22.47607	-0.41895
2015	Cote d'Ivoire	7.194091	25.41485	1.80613	2.522165	23.65876	-0.43936
2016	Cote d'Ivoire	7.179208	24.43541	3.341957	2.536129	21.52208	-0.53295
2017	Cote d'Ivoire	7.359638	26.87034	4.492346	2.547782	20.12193	-0.52712
2018	Cote d'Ivoire	6.890284	28.99985	2.96499	2.552322	19.76138	-0.50322
2019	Cote d'Ivoire	6.23171	34.7805	5.26992	2.549387	21.10748	-0.53876
2020	Cote d'Ivoire	1.958332	42.15921	4.103134	2.540585	22.43697	-0.52559
2002	Gabon	-0.24903	72.44979	8.376193	2.380176	25.10644	-0.52038
2003	Gabon	2.24733	65.6666	6.466819	2.425954	22.63881	-0.55378
2004	Gabon	0.689543	62.7236	3.627418	2.531576	21.49601	-0.82665
2005	Gabon	2.676203	46.3346	2.293864	2.679276	20.9815	-0.66007
2006	Gabon	-2.80658	48.86366	1.984646	2.807579	23.16962	-1.08307
2007	Gabon	6.008108	48.42723	8.211113	2.923064	23.64493	-1.16633
2008	Gabon	-3.30843	18.654	19.77301	3.074225	25.02588	-1.16565
2009	Gabon	0.130331	25.38382	3.95003	3.264264	29.52852	-1.07715
2010	Gabon	7.089887	23.45883	3.627783	3.459147	31.40719	-0.90526

2011	Gabon	7.091753	20.34286	2.671845	3.656322	28.68022	-0.89318
2012	Gabon	5.251077	21.04882	2.739426	3.788584	27.73728	-0.66625
2013	Gabon	5.638699	30.42369	7.323174	3.779411	29.94538	-0.6342
2014	Gabon	4.314964	26.99135	3.028408	3.606623	35.69514	-0.67764
2015	Gabon	3.878899	38.81694	3.574199	3.335251	29.23096	-0.70095
2016	Gabon	2.091442	41.25327	2.875936	3.043638	26.98226	-0.73777
2017	Gabon	0.472642	46.47103	4.462614	2.795875	21.29647	-0.82039
2018	Gabon	0.837917	43.23257	4.585344	2.603487	19.25823	-0.83791
2019	Gabon	3.920809	46.41136	4.488535	2.484043	21.8988	-0.87525
2020	Gabon	-1.83776	52.51114	9.739541	2.416957	19.89642	-0.87186
2002	Ghana	4.5	126.5601	3.679007	2.447155	18.77495	-0.34279
2003	Ghana	5.2	111.1627	6.725116	2.458528	22.93693	-0.31143
2004	Ghana	5.6	83.37636	3.192999	2.484598	28.37751	-0.27953
2005	Ghana	5.900004	69.10788	3.208103	2.51746	29.00214	-0.36875
2006	Ghana	6.399913	18.21458	1.422739	2.55439	22.95412	-0.01418
2007	Ghana	4.346819	17.41034	0.951385	2.579985	15.38454	0.038148
2008	Ghana	9.149799	16.52009	0.808988	2.578757	16.49196	-0.07746
2009	Ghana	4.844487	25.46854	0.996331	2.543822	15.47883	-0.00999
2010	Ghana	7.899712	26.4195	1.011915	2.487009	11.76409	0.01428
2011	Ghana	14.04712	27.31708	0.924422	2.424402	11.97694	-0.02913
2012	Ghana	9.292789	30.61315	1.287044	2.369483	16.10991	-0.12657
2013	Ghana	7.312525	26.38698	1.156655	2.323829	24.039	-0.09659
2014	Ghana	2.85624	34.35397	1.55436	2.291814	26.42288	-0.19492
2015	Ghana	2.120759	41.88818	2.199632	2.268778	27.01263	-0.18614
2016	Ghana	3.373466	39.02518	3.125636	2.24661	24.82617	-0.15556
2017	Ghana	8.128895	38.67697	3.631922	2.220505	18.88643	-0.22912
2018	Ghana	6.200078	36.0568	4.209467	2.192853	21.19909	-0.11502
2019	Ghana	6.507775	40.80564	3.899806	2.162584	18.03819	-0.08778
2020	Ghana	0.513942	44.25625	3.881608	2.130763	17.66075	-0.10503
2002	Guinea	5.164609	108.463	3.575855	1.987873	14.29905	-0.76705
2003	Guinea	1.248601	99.18608	3.355471	1.926564	19.81333	-0.8889
2004	Guinea	2.340117	95.52654	5.181524	1.953042	19.74645	-0.88761
2005	Guinea	2.997273	115.9662	6.315619	2.038915	18.55461	-1.07331
2006	Guinea	1.189614	75.58218	4.002109	2.148488	19.95276	-1.12154
2007	Guinea	6.817473	53.15171	2.608131	2.238941	24.66996	-1.29245
2008	Guinea	4.133009	46.5353	1.874196	2.291605	22.58948	-1.21101
2009	Guinea	-1.12264	49.35362	1.829595	2.290827	20.93561	-1.09628
2010	Guinea	4.813363	47.89231	1.1838	2.259382	19.13719	-1.22194
2011	Guinea	5.612108	48.17214	2.67363	2.21515	23.60219	-1.12737
2012	Guinea	5.915289	17.76886	1.690499	2.197959	25.11778	-1.05566
2013	Guinea	3.945684	21.01072	0.490128	2.235328	23.42939	-1.04976

2014	Guinea	3.696542	21.64174	0.609768	2.342254	22.71137	-1.06706
2015	Guinea	3.825922	23.54476	0.890834	2.489835	23.96917	-0.99246
2016	Guinea	10.82062	26.25575	0.68425	2.644358	52.41832	-0.92613
2017	Guinea	10.3	23.24681	0.795305	2.76488	25.76582	-1.01758
2018	Guinea	6.358492	22.61721	1.00515	2.833118	19.46741	-1.04045
2019	Guinea	5.616914	23.33692	0.892591	2.834785	17.43642	-0.89245
2020	Guinea	4.637278	29.11689	1.064961	2.791607	16.61173	-0.94753
2002	Kenya	0.54686	46.79714	4.08107	2.712397	17.23688	-1.00375
2003	Kenya	2.932476	45.5617	3.943628	2.709585	15.83821	-0.96462
2004	Kenya	5.1043	43.35403	2.246711	2.720779	16.25922	-0.89788
2005	Kenya	5.906666	34.64572	2.88742	2.739246	18.69911	-1.01254
2006	Kenya	6.472494	25.98158	1.674826	2.757917	19.42444	-0.93545
2007	Kenya	6.85073	23.72865	1.436798	2.768549	19.96473	-0.97859
2008	Kenya	0.232283	21.38976	1.153024	2.767256	18.86492	-1.06837
2009	Kenya	3.30694	23.15905	1.051911	2.750854	18.28649	-1.07073
2010	Kenya	8.058474	22.23807	1.008576	2.72259	20.84706	-0.91106
2011	Kenya	5.121106	23.87788	1.053083	2.693744	20.70864	-0.96374
2012	Kenya	4.56868	23.52786	1.067446	2.662808	21.58504	-1.09888
2013	Kenya	3.797848	25.23263	0.981169	2.618604	20.78579	-1.03594
2014	Kenya	5.020111	27.87759	2.201393	2.559403	23.88473	-0.9389
2015	Kenya	4.967721	31.27089	1.408523	2.491768	22.09104	-1.00606
2016	Kenya	4.213517	28.504	1.513997	2.420821	19.39174	-0.89153
2017	Kenya	3.837958	33.44162	1.922151	2.356477	19.89572	-0.95385
2018	Kenya	5.647946	34.59237	3.072071	2.305744	19.098	-0.84282
2019	Kenya	5.114159	35.31355	4.549143	2.272746	18.96157	-0.78674
2020	Kenya	-0.25016	38.45295	2.8263	2.251879	19.35315	-0.85751
2002	Madagascar	-12.408	86.46862	1.234033	3.053517	10.97024	0.001223
2003	Madagascar	9.784892	79.47309	1.12658	3.019928	13.72457	-0.20843
2004	Madagascar	5.257004	76.58655	1.657273	2.98666	21.15103	-0.3237
2005	Madagascar	4.755845	61.45235	1.388126	2.953918	19.32711	-0.05556
2006	Madagascar	5.398508	24.43694	0.971397	2.921148	20.31127	-0.18253
2007	Madagascar	5.710564	27.60659	0.409608	2.888221	26.33137	-0.18603
2008	Madagascar	6.712633	23.80623	0.370263	2.855665	37.79087	-0.26675
2009	Madagascar	-3.97871	29.95831	0.525136	2.823462	37.15834	-0.32854
2010	Madagascar	0.61924	28.02498	0.630057	2.792676	25.88589	-0.41782
2011	Madagascar	1.578427	25.15933	0.441606	2.761903	24.68602	-0.48461
2012	Madagascar	3.011148	26.58412	0.642327	2.733954	23.36573	-0.67031
2013	Madagascar	2.300376	24.38001	0.610828	2.713239	19.75481	-0.76389
2014	Madagascar	3.339203	24.22682	0.814719	2.701012	18.27815	-0.84287
2015	Madagascar	3.132298	27.46083	1.284328	2.694138	18.95947	-0.85889
2016	Madagascar	3.993146	26.03005	1.076061	2.688177	18.97726	-0.91488

2017	Madagascar	3.933308	26.38819	1.029328	2.67981	18.13942	-1.0546
2018	Madagascar	3.200013	27.85718	0.905455	2.669517	19.83697	-1.00124
2019	Madagascar	4.4	29.90058	0.86065	2.656446	21.29336	-1.03458
2020	Madagascar	-7.14061	38.45754	0.970643	2.640873	20.19352	-0.99011
2002	Mali	3.106308	75.65959	2.221625	3.017352	17.19339	-0.7246
2003	Mali	9.119042	67.17087	1.671004	3.10032	18.96748	-0.74471
2004	Mali	1.559999	62.08029	1.861958	3.173637	20.18724	-0.67758
2005	Mali	6.534779	52.63603	1.640899	3.233033	20.24107	-0.50025
2006	Mali	4.662187	23.89379	1.268374	3.294273	20.20712	-0.47921
2007	Mali	3.493617	23.34672	0.81064	3.33734	20.49818	-0.42621
2008	Mali	4.773145	21.41212	0.725692	3.32912	23.03287	-0.53726
2009	Mali	4.806322	22.47169	0.701426	3.261128	20.21128	-0.68089
2010	Mali	5.313935	23.81688	0.599486	3.158634	20.77445	-0.67681
2011	Mali	3.213134	23.23293	0.54553	3.044613	18.65662	-0.64801
2012	Mali	-0.83673	25.45221	0.499697	2.952509	14.81874	-0.83121
2013	Mali	2.295068	26.77868	0.823037	2.901045	17.12754	-0.79204
2014	Mali	7.084684	24.63169	0.711267	2.901941	17.91017	-0.7509
2015	Mali	6.1718	28.75991	0.825919	2.935999	18.35565	-0.68063
2016	Mali	5.852299	27.70158	0.870466	2.975435	18.58528	-0.6552
2017	Mali	5.305456	28.78308	0.955042	2.999199	18.24986	-0.64361
2018	Mali	4.746484	27.96583	1.162196	3.008065	18.69789	-0.69069
2019	Mali	4.756161	30.619	1.288471	2.996255	20.04255	-0.69189
2020	Mali	-1.23545	36.30648	1.465483	2.971043	19.86351	-0.78361
2002	Mauritania	1.381484	122.0769	2.947843	2.762404	41.98003	-0.08303
2003	Mauritania	6.92827	109.9497	2.60952	2.805846	47.55897	-0.07434
2004	Mauritania	4.732758	94.70924	2.324891	2.832846	44.77638	-0.3651
2005	Mauritania	8.566287	76.03321	2.186863	2.849285	40.7269	-0.53538
2006	Mauritania	18.3332	40.57265	2.393064	2.859011	36.39661	-0.74641
2007	Mauritania	-1.96942	59.93756	2.831767	2.869946	42.20754	-0.57647
2008	Mauritania	-0.33108	54.99134	1.222151	2.884601	37.20077	-0.78507
2009	Mauritania	0.097876	65.91767	1.64315	2.905321	36.39423	-0.60822
2010	Mauritania	2.62023	63.96578	2.049608	2.926972	33.27887	-0.71273
2011	Mauritania	4.172783	56.63168	1.908188	2.945321	29.42613	-0.64166
2012	Mauritania	4.470013	65.4348	2.309376	2.954521	33.23476	-0.79357
2013	Mauritania	4.150813	64.33269	2.434062	2.94921	32.72077	-0.84668
2014	Mauritania	4.274823	71.46917	3.831866	2.927191	37.96433	-0.93253
2015	Mauritania	5.376339	83.40891	4.047458	2.893699	34.30246	-0.91143
2016	Mauritania	1.260909	80.86504	4.136899	2.855988	29.00154	-0.73659
2017	Mauritania	6.270546	78.19616	4.787651	2.819235	30.29027	-0.74837
2018	Mauritania	4.526746	71.42611	5.294528	2.780089	39.27244	-0.79025
2019	Mauritania	5.759931	68.90094	4.907606	2.741483	45.37365	-0.8456

2020	Mauritania	-1.76332	73.13165	3.747492	2.702228	45.16326	-0.79329
2002	Mauritius	1.614919	42.07485	4.82316	0.69424	21.42302	0.328717
2003	Mauritius	5.925445	55.7395	13.32682	0.723662	22.49562	0.192946
2004	Mauritius	4.33002	50.71674	9.480034	0.627104	21.70749	0.152765
2005	Mauritius	1.777543	56.03637	12.34202	0.5921	21.47984	0.219138
2006	Mauritius	4.865545	49.49197	19.71186	0.466404	23.19514	0.273244
2007	Mauritius	5.727016	67.74406	19.13818	0.455526	23.99544	0.350999
2008	Mauritius	5.386963	64.10631	13.00226	0.361631	23.75657	0.440311
2009	Mauritius	3.315077	79.71505	21.59139	0.265538	25.51104	0.465923
2010	Mauritius	4.377203	79.98392	22.30961	0.237887	24.15759	0.48235
2011	Mauritius	4.077538	88.21459	12.73942	0.16014	23.45916	0.463921
2012	Mauritius	3.496118	88.63803	27.26722	0.277321	22.58273	0.252168
2013	Mauritius	3.360406	95.0654	19.08599	0.220399	20.84281	0.252099
2014	Mauritius	3.744576	92.64037	45.11784	0.181061	18.87176	0.317964
2015	Mauritius	3.553072	81.40127	33.87645	0.132433	17.35941	0.254002
2016	Mauritius	3.837933	79.09539	13.59321	0.068723	17.2484	0.136082
2017	Mauritius	3.814152	108.7456	20.14315	0.090187	17.38819	0.187209
2018	Mauritius	3.759677	101.4665	20.25325	0.054547	18.75135	0.214242
2019	Mauritius	3.012376	115.043	20.47847	0.03224	19.6175	0.241274
2020	Mauritius	-14.8947	155.6638	21.98336	0.002291	17.89008	0.46565
2002	Mozambique	9.291052	102.2232	5.324767	2.932469	18.80422	-0.49913
2003	Mozambique	6.878533	89.80463	5.282985	2.976707	13.98634	-0.64218
2004	Mozambique	7.916408	81.71977	4.786384	2.953465	11.8109	-0.61336
2005	Mozambique	6.645908	73.22608	4.802243	2.887891	12.21086	-0.53464
2006	Mozambique	9.694374	56.41441	6.426267	2.820125	11.57735	-0.61825
2007	Mozambique	7.729746	52.8962	11.75735	2.775212	10.52261	-0.51288
2008	Mozambique	7.317755	46.82764	5.076918	2.745466	14.47233	-0.48718
2009	Mozambique	6.318197	52.33119	4.381305	2.736961	13.4539	-0.42872
2010	Mozambique	6.502353	55.24723	6.237887	2.743657	17.01749	-0.43699
2011	Mozambique	7.417384	44.27999	4.757044	2.749317	20.49365	-0.4962
2012	Mozambique	7.258439	43.84504	2.920175	2.753163	32.46239	-0.56902
2013	Mozambique	6.963607	75.48933	3.083525	2.769045	37.62853	-0.6026
2014	Mozambique	7.398513	75.87171	4.278744	2.798573	40.60696	-0.66938
2015	Mozambique	6.723279	90.10387	3.735748	2.834747	31.33179	-0.75936
2016	Mozambique	3.824214	121.66	4.140834	2.872081	25.92248	-0.88365
2017	Mozambique	3.741318	123.3606	3.5108	2.900672	22.83998	-0.83823
2018	Mozambique	3.443814	128.3731	3.758322	2.913618	26.94593	-0.78795
2019	Mozambique	2.314606	133.2805	5.723585	2.907001	24.01392	-0.85269
2020	Mozambique	-1.23391	154.4052	11.34249	2.88683	23.11131	-0.76631
2002	Niger	4.918471	63.22411	0.904529	3.664564	13.11248	-1.02049
2003	Niger	2.17061	60.46601	1.068659	3.68828	12.97497	-0.91642

2004	Niger	0.363802	49.48702	1.007159	3.709069	14.25205	-0.88732
2005	Niger	7.331869	42.12406	0.869406	3.727929	18.22109	-0.72455
2006	Niger	5.93105	15.0561	3.358713	3.742058	19.02365	-0.84892
2007	Niger	3.142724	17.97468	0.504287	3.756576	18.80511	-0.76108
2008	Niger	7.731414	12.32618	0.376579	3.778529	25.52194	-0.73039
2009	Niger	1.962601	16.10109	0.483462	3.809666	28.42993	-0.6112
2010	Niger	8.578167	18.51569	0.309997	3.844167	31.87047	-0.65825
2011	Niger	2.357757	23.72627	0.351927	3.876414	31.56277	-0.65286
2012	Niger	10.54894	18.3099	0.422958	3.898743	28.80514	-0.64769
2013	Niger	5.315131	18.66496	0.69716	3.907317	29.59488	-0.61887
2014	Niger	6.642137	17.66658	1.005623	3.899847	30.78426	-0.69522
2015	Niger	4.392649	21.96483	0.865423	3.881452	32.60701	-0.65087
2016	Niger	5.740893	23.56105	1.038837	3.859843	27.01088	-0.64362
2017	Niger	5.00136	26.33631	1.148257	3.839001	25.79504	-0.66551
2018	Niger	7.210803	23.84896	0.93041	3.816737	28.4905	-0.57055
2019	Niger	5.941397	26.77269	1.040518	3.794207	30.31499	-0.52591
2020	Niger	3.580006	34.89354	1.413457	3.771351	31.06514	-0.61767
2002	Nigeria	15.32916	40.30195	1.654052	2.521517	26.76866	-1.50207
2003	Nigeria	7.347195	42.27652	1.677438	2.537254	28.3709	-1.41765
2004	Nigeria	9.250558	35.21739	1.351721	2.559658	26.06325	-1.38337
2005	Nigeria	6.438517	17.87779	5.410874	2.585689	24.96612	-1.18078
2006	Nigeria	6.059428	5.600018	2.899031	2.610843	26.1665	-1.12639
2007	Nigeria	6.59113	5.871894	0.383088	2.632171	20.18004	-1.06694
2008	Nigeria	6.764473	5.080844	0.21161	2.649868	18.85977	-0.90095
2009	Nigeria	8.036925	6.880609	0.27014	2.662921	21.11545	-1.04189
2010	Nigeria	8.005656	5.502671	0.367465	2.671443	16.81501	-1.05151
2011	Nigeria	5.307924	5.491002	0.137295	2.677886	15.67631	-1.18936
2012	Nigeria	4.230061	4.950816	0.308396	2.68093	14.21112	-1.17593
2013	Nigeria	6.671335	5.063753	0.102518	2.676908	14.16873	-1.22687
2014	Nigeria	6.309719	5.417664	0.86024	2.665007	15.08353	-1.2835
2015	Nigeria	2.652693	6.838346	0.337955	2.647406	14.82718	-1.07022
2016	Nigeria	-1.61687	9.020755	0.629288	2.627675	14.72496	-1.02191
2017	Nigeria	0.805887	12.56816	0.969126	2.607667	14.71562	-1.07794
2018	Nigeria	1.922757	14.3065	1.416961	2.586551	19.01838	-1.06472
2019	Nigeria	2.208429	13.8533	1.183746	2.564872	24.62523	-1.07928
2020	Nigeria	-1.79425	16.94285	1.330997	2.542973	26.7442	-1.08272
2002	Rwanda	13.19208	74.62659	0.97462	2.352234	12.62456	-0.71607
2003	Rwanda	2.202403	73.81993	1.061201	1.532028	13.17659	-0.58859
2004	Rwanda	7.44768	71.34352	1.14166	1.431261	14.36501	-0.41259
2005	Rwanda	9.377899	52.5456	0.972054	1.823079	15.1559	-0.62917
2006	Rwanda	9.227048	13.18445	0.813972	2.271703	14.68185	-0.20553

2007	Rwanda	7.633311	15.28613	0.582284	2.516	16.29437	0.007068
2008	Rwanda	11.16124	18.07215	0.930939	2.668199	20.62648	0.108793
2009	Rwanda	6.24826	19.54669	0.700998	2.675189	20.28721	0.108439
2010	Rwanda	7.334656	20.3183	0.855819	2.58885	19.87924	0.36517
2011	Rwanda	7.958386	21.40604	0.681008	2.498523	20.5152	0.362672
2012	Rwanda	8.641521	24.0412	1.130223	2.459799	22.64583	0.55988
2013	Rwanda	4.719837	30.12262	1.422446	2.451951	23.6901	0.625127
2014	Rwanda	6.167168	36.13676	2.106403	2.485526	22.65032	0.7763
2015	Rwanda	8.856861	41.20907	2.204605	2.5427	23.97373	0.615097
2016	Rwanda	5.970744	51.0962	2.629245	2.602494	27.15199	0.635859
2017	Rwanda	3.97629	56.64231	2.730462	2.639762	22.71367	0.63156
2018	Rwanda	8.579438	61.13563	2.829079	2.644061	22.94962	0.564932
2019	Rwanda	9.460598	65.09736	3.247045	2.607314	26.88618	0.54918
2020	Rwanda	-3.35885	81.14467	2.851766	2.543388	25.29956	0.553835
2002	Senegal	0.068697	59.65553	3.208567	2.437074	20.4321	0.247914
2003	Senegal	5.593951	50.69969	2.8167	2.475747	17.41023	-0.14131
2004	Senegal	4.643294	39.45602	3.419137	2.516259	17.49769	0.023222
2005	Senegal	4.310239	35.36579	1.864003	2.557531	18.29402	-0.03538
2006	Senegal	2.330771	18.50709	1.601784	2.600216	21.21406	-0.37309
2007	Senegal	2.827119	23.0122	1.366122	2.642673	21.05847	-0.5143
2008	Senegal	3.703169	21.86849	1.078333	2.681445	22.58271	-0.50016
2009	Senegal	2.752104	29.67066	1.235702	2.714997	19.89218	-0.49005
2010	Senegal	3.390889	30.9475	1.907973	2.743128	18.51659	-0.64139
2011	Senegal	1.334091	30.62077	2.061112	2.766757	21.01604	-0.50373
2012	Senegal	4.002996	34.41884	1.861982	2.785615	20.70243	-0.25842
2013	Senegal	2.412385	34.17763	2.148163	2.799132	22.16892	-0.18887
2014	Senegal	6.224074	34.14312	2.144788	2.806699	23.47965	0.058831
2015	Senegal	6.367044	39.12086	2.179758	2.80829	23.01733	0.055391
2016	Senegal	6.369684	40.63473	2.272393	2.80733	23.92812	-0.00014
2017	Senegal	7.393737	48.11622	3.465638	2.800577	25.82566	-0.08851
2018	Senegal	6.209241	56.32113	3.865064	2.78188	28.32157	-0.02209
2019	Senegal	4.613628	66.83347	4.054529	2.749962	29.66293	0.010636
2020	Senegal	1.325505	71.69028	5.616293	2.709391	29.47379	0.007891
2002	Sierra Leone	26.41732	115.132	1.283797	4.356749	11.67171	-0.78946
2003	Sierra Leone	9.313121	115.9664	1.387566	4.629677	11.22725	-0.89278
2004	Sierra Leone	6.597945	118.8436	1.564535	4.380945	10.32499	-0.88141
2005	Sierra Leone	4.505096	111.914	1.13834	3.820703	11.29964	-1.08549
2006	Sierra Leone	4.223914	82.7285	1.335248	3.200501	10.37877	-1.02615
2007	Sierra Leone	8.058145	24.33691	0.471362	2.714485	9.453366	-0.91934
2008	Sierra Leone	5.398285	23.46925	0.218879	2.375021	9.111825	-0.97887
2009	Sierra Leone	3.188051	32.15243	0.298133	2.243077	9.622046	-0.94229

2010	Sierra Leone	5.346466	35.72375	0.445586	2.252567	30.71586	-0.78079
2011	Sierra Leone	6.315045	36.20411	0.643369	2.274594	41.53801	-0.86004
2012	Sierra Leone	15.18177	34.02849	0.528244	2.250019	25.59815	-0.9574
2013	Sierra Leone	20.71577	28.60404	0.56197	2.230245	14.44929	-0.91197
2014	Sierra Leone	4.556772	29.27269	0.719089	2.207086	13.10977	-0.94812
2015	Sierra Leone	-20.5988	37.44017	1.24607	2.181429	15.56704	-0.79608
2016	Sierra Leone	6.055474	49.65262	1.143428	2.16462	18.92069	-0.81801
2017	Sierra Leone	4.19261	48.24373	1.581986	2.154069	18.07937	-0.56802
2018	Sierra Leone	3.464602	46.19394	1.590523	2.136636	13.06093	-0.48922
2019	Sierra Leone	5.254241	46.03625	1.686819	2.109038	12.08493	-0.44548
2020	Sierra Leone	-1.96895	53.03307	2.250125	2.074501	11.67368	-0.37105
2002	South Africa	3.700374	27.78969	4.118633	1.263923	14.02729	0.332902
2003	South Africa	2.949075	19.71258	2.248128	1.223854	14.65691	0.275541
2004	South Africa	4.55456	16.94381	1.595146	1.217762	15.16724	0.397753
2005	South Africa	5.277052	14.91661	1.697979	1.237741	15.8783	0.483857
2006	South Africa	5.603806	18.95228	2.528109	1.263623	17.36554	0.378271
2007	South Africa	5.360474	21.94691	1.357428	1.291498	19.02162	0.197672
2008	South Africa	3.191044	23.49959	2.20594	1.334117	21.61482	0.153829
2009	South Africa	-1.53809	24.76383	1.640405	1.391535	19.49086	0.125427
2010	South Africa	3.039733	26.49558	1.548189	1.455282	17.56164	0.065393
2011	South Africa	3.168556	26.60847	1.444111	1.524514	17.80937	-0.00423
2012	South Africa	2.396232	34.91899	2.449718	1.581354	17.93493	-0.18417
2013	South Africa	2.485468	36.18294	3.38385	1.604367	18.57871	-0.13783
2014	South Africa	1.413826	38.314	2.289694	1.583787	18.3012	-0.12488
2015	South Africa	1.321862	36.82091	6.373555	1.532243	18.00895	-0.0437
2016	South Africa	0.664552	45.66119	4.508873	1.471933	17.4415	0.044075
2017	South Africa	1.157947	47.16461	3.954913	1.416947	16.39881	-0.1015
2018	South Africa	1.487617	44.23645	7.128873	1.363703	15.85022	-0.11213
2019	South Africa	0.113054	49.00374	6.060681	1.316292	15.3467	0.020065
2020	South Africa	-6.43197	51.77591	8.707732	1.273356	13.71686	-0.01078
2002	Sudan	6.006472	92.94868	0.840626	2.589286	25.61929	-1.03582
2003	Sudan	6.288808	84.55622	1.355542	2.598709	26.22331	-1.17006
2004	Sudan	5.140889	71.97206	1.283893	2.526069	28.04905	-1.2469
2005	Sudan	5.643516	51.95327	1.184745	2.404565	28.46359	-1.38764
2006	Sudan	6.531412	42.74202	0.701835	2.275437	29.03854	-1.19128
2007	Sudan	5.735274	34.61732	0.673358	2.183056	27.03019	-1.32981
2008	Sudan	3.846745	32.89483	0.592535	2.14074	26.22177	-1.42751
2009	Sudan	-2.7677	42.1511	0.872215	2.163115	27.64458	-1.15031
2010	Sudan	3.858242	40.73807	0.719994	2.228245	25.25806	-1.19666
2011	Sudan	-3.21353	41.33864	0.736615	2.3026	21.68837	-1.20463
2012	Sudan	-17.0047	61.28332	0.61276	2.359808	24.59938	-1.50338

2013	Sudan	1.955145	55.93693	0.481626	2.398963	26.65782	-1.48882
2014	Sudan	4.66138	44.83108	0.346671	2.412107	34.84552	-1.46264
2015	Sudan	1.910177	42.32565	0.629713	2.407202	37.05885	-1.48305
2016	Sudan	3.467642	50.50225	0.29151	2.398795	35.5338	-1.54605
2017	Sudan	0.709256	54.75484	0.189814	2.395242	39.54908	-1.5452
2018	Sudan	-2.68093	73.851	0.706621	2.392258	36.71006	-1.4395
2019	Sudan	-2.17825	90.74248	0.644712	2.391434	35.80424	-1.41525
2020	Sudan	-3.62981	115.593	0.579889	2.391072	31.92745	-1.42746
2002	Tanzania	7.093195	51.02538	0.74578	2.722292	19.29091	-0.84093
2003	Tanzania	6.67279	48.77692	0.588359	2.798989	21.69433	-0.73454
2004	Tanzania	7.503815	52.54019	0.747387	2.827163	25.66523	-0.56557
2005	Tanzania	7.476319	46.74834	0.72506	2.823755	28.54497	-0.60761
2006	Tanzania	6.532221	22.10714	0.472479	2.816487	31.50319	-0.22858
2007	Tanzania	6.768535	23.45698	0.332567	2.823941	33.88753	-0.33575
2008	Tanzania	5.686417	21.93144	0.265944	2.841465	36.06015	-0.41635
2009	Tanzania	5.269105	27.00912	0.570755	2.872959	30.99674	-0.44785
2010	Tanzania	6.336523	28.42933	0.608824	2.911889	30.77057	-0.54228
2011	Tanzania	7.672155	29.88535	0.431059	2.948419	35.09953	-0.60336
2012	Tanzania	4.500154	30.80921	0.430719	2.975663	32.96518	-0.76462
2013	Tanzania	6.781586	31.09219	0.551066	2.994062	33.95704	-0.78095
2014	Tanzania	6.732462	33.00316	0.620053	3.001801	33.17035	-0.76107
2015	Tanzania	6.160629	39.03914	1.00636	3.001067	31.87113	-0.6862
2016	Tanzania	6.867116	39.93876	1.513161	2.997574	32.75384	-0.50964
2017	Tanzania	6.78568	41.1049	1.558791	2.991812	35.4598	-0.46472
2018	Tanzania	5.444968	39.76395	1.857743	2.979481	39.04883	-0.45352
2019	Tanzania	5.8	39.03159	2.002136	2.960386	42.55369	-0.37159
2020	Tanzania	1.996344	41.25045	2.029839	2.936778	42.91082	-0.35758
2002	Togo	3.826623	95.07015	0.879561	2.621478	15.85815	-0.75807
2003	Togo	6.720171	82.77488	0.926033	2.538001	16.034	-0.90224
2004	Togo	-0.97867	82.57102	0.987777	2.540161	15.03759	-0.94399
2005	Togo	-4.6663	75.10014	0.946065	2.597269	16.06061	-0.87377
2006	Togo	2.650132	77.55721	1.156256	2.659398	17.96231	-1.04961
2007	Togo	-1.17512	74.73257	0.586921	2.695973	17.6593	-0.99727
2008	Togo	4.062253	49.53111	5.901456	2.716929	17.98875	-0.97576
2009	Togo	5.537911	51.28207	1.602158	2.714931	20.20276	-1.03231
2010	Togo	6.099259	37.55446	1.070286	2.696298	21.18879	-0.96742
2011	Togo	6.398199	15.21628	0.369721	2.677533	27.82276	-1.02653
2012	Togo	6.543507	19.31935	0.599932	2.660911	25.50879	-1.00772
2013	Togo	6.112343	21.2935	1.217014	2.635745	27.30133	-1.03469
2014	Togo	5.920589	22.1253	1.323108	2.60115	29.99522	-0.89991
2015	Togo	5.742868	25.39273	1.403479	2.561	31.2773	-0.73391

2016	Togo	5.559079	20.02251	1.486073	2.518687	22.51843	-0.68837
2017	Togo	4.347748	25.7135	1.6695	2.479331	16.8567	-0.71242
2018	Togo	4.976213	24.11238	1.633798	2.445904	18.10991	-0.72773
2019	Togo	5.459921	27.7537	1.584327	2.420236	20.5431	-0.72556
2020	Togo	1.752825	33.54398	1.386757	2.400664	23.6126	-0.70752
2002	Uganda	8.732686	66.50298	1.178712	3.141284	19.96328	-1.02574
2003	Uganda	6.473259	70.75517	1.404455	3.180408	20.68333	-0.94851
2004	Uganda	6.807233	62.00097	1.338726	3.184828	19.94443	-0.81188
2005	Uganda	6.332565	49.74304	1.915464	3.167959	22.20172	-0.83365
2006	Uganda	10.78474	13.36937	1.026367	3.15329	20.92496	-0.78762
2007	Uganda	8.412426	14.16025	0.570678	3.151809	21.86888	-0.82575
2008	Uganda	8.708752	16.17163	0.523344	3.155901	22.74825	-0.84016
2009	Uganda	6.801517	11.17634	0.290527	3.167526	24.03235	-0.90979
2010	Uganda	5.637612	11.34001	0.242043	3.18661	25.73263	-0.92349
2011	Uganda	9.391655	11.88966	0.231874	3.182452	25.6044	-0.9364
2012	Uganda	3.837456	14.12746	0.254572	3.18075	25.03286	-1.00158
2013	Uganda	3.586906	30.2751	0.309877	3.233782	30.31176	-1.05595
2014	Uganda	5.106307	27.14973	0.647648	3.352682	25.48517	-1.09738
2015	Uganda	5.18786	30.13522	0.298478	3.497748	22.4433	-1.06339
2016	Uganda	4.781	35.15339	2.943155	3.656864	24.87111	-1.07059
2017	Uganda	3.131406	38.88199	0.625736	3.755687	24.05242	-1.0529
2018	Uganda	6.303924	38.484	1.653212	3.725164	23.75044	-1.03213
2019	Uganda	6.438745	40.56996	0.870745	3.541932	24.90246	-1.14086
2020	Uganda	2.951306	46.53501	1.873493	3.269713	23.51787	-1.03217
2002	Zimbabwe	-8.89402	66.72016	1.865981	0.254517	10.17249	-1.15676
2003	Zimbabwe	-16.9951	84.96292	1.446955	0.233334	13.81376	-1.18887
2004	Zimbabwe	-5.80754	91.0885	2.496029	0.314072	5.107808	-1.25356
2005	Zimbabwe	-5.71108	82.79718	4.546183	0.47132	2.000441	-1.31462
2006	Zimbabwe	-3.4615	97.59782	2.078834	0.650369	2.224682	-1.37295
2007	Zimbabwe	-3.65333	118.0371	2.244333	0.822767	5.078394	-1.40476
2008	Zimbabwe	-17.6689	146.5215	2.365516	1.003707	3.28591	-1.34884
2009	Zimbabwe	12.01956	64.58119	1.276866	1.183728	9.929206	-1.35788
2010	Zimbabwe	19.67532	56.87092	3.253934	1.353964	17.01173	-1.37329
2011	Zimbabwe	14.19391	53.35626	8.335991	1.536406	14.63471	-1.42563
2012	Zimbabwe	16.66543	52.82096	4.410509	1.698084	12.14834	-1.3818
2013	Zimbabwe	1.989493	44.76412	3.115374	1.777672	9.181371	-1.41967
2014	Zimbabwe	2.376929	43.62508	2.676643	1.754741	9.609292	-1.40437
2015	Zimbabwe	1.779873	49.2188	3.381401	1.663694	9.995567	-1.31781
2016	Zimbabwe	0.755869	56.88835	6.142417	1.549294	9.807839	-1.27126
2017	Zimbabwe	4.709492	72.41563	4.141331	1.459406	9.663851	-1.28108
2018	Zimbabwe	4.824211	70.85902	3.403335	1.410382	9.666066	-1.22758

2019	Zimbabwe	-6.14424	64.79738	8.401156	1.421142	7.404433	-1.27328
2020	Zimbabwe	-6.24875	73.02174	5.620856	1.473871	7.450778	-1.28944

APPENDIX 1 Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Economic growth	570	4.143	4.939	-36.392	33.629
External Debt Stock	570	44.171	29.913	3.895	175.849
Domestic Payment	570	2.837	4.324	.053	45.118
Population Growth	570	2.559	.785	.002	4.63
Domestic Investment	570	21.53	7.854	2	59.723
Corruption	570	-.725	.58	-1.575	1.245

APPENDIX 2 Pairwise correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) Economic growth	1.000					
(2) External Debt Stock	-0.173	1.000				
(3) External DS Payment	-0.089	0.394	1.000			
(4) Population Growth	0.280	-0.163	-0.371	1.000		
(5) Domestic Investment	0.183	-0.139	-0.031	0.258	1.000	
(6) Corruption	0.037	-0.078	0.187	-0.369	0.149	1.000

APPENDIX 3 fixed effects Regression results

Economic growth	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
External Debt Stock	-.03	.008	-3.59	0	-.046	-.014	***
Debt S Payment	-.032	.083	-0.39	.696	-.195	.13	
Population Growth	4.926	.665	7.41	0	3.62	6.231	***
Domestic Investment	.092	.037	2.48	.014	.019	.165	**
Corruption	.006	.999	0.01	.995	-1.956	1.969	
Constant	-9.033	2.076	-4.35	0	-13.112	-4.954	***

Mean dependent var		4.143	SD dependent var			4.939	
R-squared		0.139	Number of obs			570	
F-test		17.262	Prob > F			0.000	
Akaike crit. (AIC)		3290.829	Bayesian crit. (BIC)			3316.902	

*** p<.01, ** p<.05, * p<.1

APPENDIX 4 Random effects Regression results

Economic growth	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
External Debt Stock	-.024	.008	-3.14	.002	-.039	-.009	***
Domestic Payment	.048	.062	0.77	.44	-.074	.169	
Population Growth	2.213	.372	5.96	0	1.485	2.941	***
Domestic Investment	.058	.03	1.91	.056	-.001	.118	*
Corruption	1.045	.485	2.15	.031	.095	1.996	**
Constant	-1.087	1.134	-0.96	.338	-3.309	1.135	

Mean dependent var	4.143	SD dependent var		4.939
Overall r-squared	0.119	Number of obs		570
Chi-square	69.054	Prob > chi2		0.000
R-squared within	0.123	R-squared between		0.383

*** p<.01, ** p<.05, * p<.1

APPENDIX 5 Robust fixed effects without interaction Regression results

Economic growth	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
External Debt Stock	-.03	.013	-2.23	.034	-.057	-.002	**
Debt service Payment	-.032	.108	-0.30	.767	-.253	.189	
Population Growth	4.926	1.056	4.66	0	2.766	7.086	***
Domestic Investment	.092	.043	2.15	.04	.005	.18	**
Corruption	.006	1.654	0.00	.997	-3.377	3.389	
Constant	-9.033	3.564	-2.53	.017	-16.322	-1.744	**

Mean dependent var	4.143	SD dependent var		4.939
R-squared	0.139	Number of obs		570
F-test	5.877	Prob > F		0.001
Akaike crit. (AIC)	3288.829	Bayesian crit. (BIC)		3310.557

*** p<.01, ** p<.05, * p<.1

APPENDIX 6 Breusch and Pagan Lagrangian multiplier test for Random Effects

$$gdp(country1,t) = Xb + u(country1) + e(country1,t)$$

	Var	Sd=sqrt (Var)
GDP	24.39034	4.938657

E	19.64501	4.432269
U	1.048347	1.023888

Test: Var (u) =0

Chibar2 (01) =8.73

Prob>chibar2=0.0016

APPENDIX 7 Heteroskedasticity test

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of Economic growth
chi2(1) = 103.97
Prob > chi2 = 0.0000