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**ADDIS ABABA UNIVERSITY**  
**SCHOOL OF GRADUATE STUDIES**  
**COLLEGE OF BUSINESS AND ECONOMICS**  
**DEPARTMENT OF ECONOMICS**

**THE EFFECT OF EXTERNAL INDEBTEDNESS ON POVERTY  
REDUCTION IN SUB-SAHARAN AFRICA COUNTRIES**

**BY: SOLOMON SENBETO**

**SEPTEMBER 2021**  
**ADDIS ABABA ETHIOPIA**

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**BY: SOLOMON SENBETO**

**ADVISOR: ATNAFU G/MESKEL (PhD)**

**A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES, ADDIS  
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## **Abstract**

*Foreign borrowing by itself not a problem when properly utilized for productive investment and does not suffer from macroeconomic instabilities and policies that distort economic incentives. It may not also be a problem when economic growth is high enough to repay the debt as well as to finance additional investment demand. However, reckless borrowing and poor debt management system crowds-out investment and social safety net expenditures, thus adversely affecting poverty reduction efforts. This thesis examines the impact of external indebtedness on poverty in sub-Saharan African (SSA). By employing system generalized method of moments and random/fixed effects estimation, the thesis models the impact of external debt with income and other variables of interest on poverty, measured by poverty headcount ratio, life expectancy at birth child, child mortality rate and gross primary school enrolment rate. The empirical results indicate that there exist negative impacts of external debt on GDP growth, and poverty headcount ratio, life expectancy at birth and gross primary school enrolment rate. However, under-five child mortality was lower in SSA countries with high external debt. Another important finding is that the life expectancy at birth increase as improvement in real GDP per capita and capital formation as well as in the absence of violence/terrorism, but it decreases by inflation rise. Similarly, the rate of child mortality reduces as per capita income of GDP and capital formation increases and in the absence of violence/terrorism, but it rises by inflation increases. The main conclusion is that external debt indicators have a direct impact on poverty. The study also concluded after the effect of income of the level of poverty has been taken into account, external indebtedness has a limited but significant impact on poverty reduction. A negative relationship finding between external debt and poverty indicators does not necessarily indicate that SSA countries should restraint on external borrowing in order to improve growth. Rather, given external debt impact on the poverty reduction, governments in SSA would ensure external borrowings are invested in projects sooner or later generate enough earnings to reimburse the debt back. The nexus between external debt, economic growth and poverty require further research by controlling for institutional quality and management factors.*

**Key Words:** External debt, Economic Growth, Poverty, Standard Human Development Indicators (SHDI) and sub-Saharan Africa (SSA).

## Declaration

I hereby declare that this MSc. thesis entitled *“The Effect of External Indebtedness on Poverty Reduction in Sub-Saharan Africa Countries”* was carried out by me for the masters of economics under the guidance and supervision of Dr. Atnafu G/Meskel, Addis Ababa University, College of Business and Economics, Department of Economics.

The interpretations put forth are based on my reading and understanding of the original texts and they are not published anywhere in the form of books, articles and reports. The other books, articles and websites, which I have made use of are acknowledged at the respective place in the text.

For the present thesis, which I am submitting to the University, no degree or diploma or distinction has been conferred on me before, either in this or in any other University.

Declared by:

Name \_\_\_\_\_

Signature \_\_\_\_\_

Date \_\_\_\_\_

Confirmed by:

Name \_\_\_\_\_

Signature \_\_\_\_\_

Date \_\_\_\_\_

Place and date of submission \_\_\_\_\_

**Addis Ababa University**  
**School of Graduate Studies**

This is to certify that the thesis prepared by Solomon Senbeto, entitled with: *The Effect of External Indebtedness on Poverty Reduction in Sub-Saharan Africa Countries*, and submitted in partial fulfillment of the requirements for the Degree of Master of Science in Economics (Economic Policy Analysis) complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

Signed by the Examining Committee:

External Examiner Misgana Asmelash, PhD    Signature \_\_\_\_\_ Date \_\_\_\_\_

Internal Examiner: Gebeyehu Manie Fetene, PhD    Signature \_\_\_\_\_ Date \_\_\_\_\_

Advisor: Atnafu G/Meskel, PhD    Signature \_\_\_\_\_ Date \_\_\_\_\_

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## List of Acronyms

DRS	The Debtor Reporting System
FE	Fixed Effect
GDP	Growth Domestic Product
GMM	General Method of Moment
GNI	Gross National Income
HIPC	Highly Indebted Poor Countries
IBRD	International Bank Reconciliation and Development
IDA	International Development Association
IDS	International Debt Statistics
IMF	International Monetary Fund
LDCs	Least Developing Countries
MDRI	Multilateral Debt Relief Initiatives
RE	Random Effect
SHDI	Standard Human Development Indicator
SSA	Sub-Saharan Africa
UN	United Nation
WB	World Bank
WDI	World Development Indicator

# CHAPTER ONE

## INTRODUCTION

### 1.1 Background of the Study

Sound macroeconomic and social policies are the most effective tool to alleviate poverty. These development-focused policies encourage both private and public investment and, hence, help to achieve economic growth. When sustainable economic growth is achieved, and utilized and shared effectively, it will generate wealth, income, goods, and services, and hence reduce the country's level of poverty. Strong economic growth, therefore, boosts the production base of a country and advances human development by putting positive pressure on national income, employment, inflation, and social safety net provision. A strong production base also promotes self-dependence and thus reduces heavy reliance on external donations and borrowing. However, foreign borrowing in several African countries has rapidly increased in recent years though they were benefited from the Heavily Indebted Poor Countries (HIPC) Initiative and Multilateral Debt Relief (MDR) programs.

The stock of public external debt in some Sub-Saharan African (SSA) countries has increasing over recent decades to a level that it is generally considered as unsustainable (Lawanson, 2014). While it has been acknowledged that the obligation of repaying the accumulated value of these debts may not be feasible, a fear has been expressed that it is likely to be compounding the economic problem and hence to poverty alleviation

According to IMF regional report (2018), among low-income and developing sub-Saharan African countries, seven countries (namely, Eritrea, Gambia, Mozambique, Republic of Congo, São Tomé and Príncipe, South Sudan and Zimbabwe), which accounting for 3 percent of regional GDP, are in debt distress, and nine countries (namely, Burundi, Cape Verde, Cameroon, Central African Republic, Chad, Ethiopia, Ghana, Sierra Leone and Zambia), which accounting for 16 percent of the regional GDP are at high risk of debt distress. The remaining nineteen low-income and developing countries of SSA countries have low to moderate debt vulnerabilities. For middle and upper-income countries, public debt remains sustainable under the baseline in most cases. When a country is struggling to service its debt as demonstrated by arrears, restructuring of its debt or other clear signs indicates that a debt crisis is looming, and henceforth a country is in debt distress.

A decade and half after the massive debt forgiveness, African debt is in the global newsflash again. Since 2010, the SSA region's external debt has been on the rise, with the stock external debt as increased from US\$325 billion in 2011 to US\$625 billion in 2019. Thus, we can witness stock external debt recent years increasing rapidly. Because of the rapid increase in debt burden over recent years, about one-third of the countries in sub-Saharan Africa are either in or at high risk of debt distress, including the majority of countries that benefited from debt relief in the 1990s. The ratio of external debt to export earning in this region close to double (138%) in 2018 related to the average percent of 70% in 2010 (World Bank, 2019). To assess whether this time is different, it is important to examine the drivers of this debt buildup, the composition of debt, and its design features. In many least developing countries in general and SSA countries in particular, according to Akanbi (2014) suggestion, in order to achieve sustained economic growth external borrowing is a critical element reach developmental goals and upsurge investment in infrastructure. And the ultimate goal of the economic policy is to achieve a high and stable economic growth level. In emerging and least developing countries, foreign financing considered as an important source for financing economic growth (Doğan and Bilgili, 2014).

External debt by itself is not problem if borrowed funds properly utilized for productive investment, and do not suffer from macroeconomic instabilities and policies that distort economic incentives (Amakom, 2003). It may not be also a problem when economic growth is high enough to pay back the debt as well as finance additional investment demand (Africa Economic Chart Book, 2018). External debt allows various entities to finance growth opportunities that it would not be able to do that with their own funds and resources. It also plays a role for financing investments and imports, enabling the developing country to reach economic growth and reduce its poverty.

In the case of developing countries especially sub-Saharan Africa countries, however, this has not been the case. In the last decade, Africa got an average of about \$40 billion in foreign aid each year (World Bank, 2018). But this aid hasn't been a catalyst's for change in the region. There are many reasons behind this, including corruption, bad institutions, aid fragmentation, and lack of ownership. Thus, Sub-Saharan Africa underperforms every other region in terms of domestic revenue mobilization. The decreasing economic performance and the accumulation of large external debt stock in SSA lead to a growing concern among the African and international

community. The growing indebtedness of these countries is often mentioned as a major reason for their poor economic performance.

The external debt levels of SSA countries have been on the rise in recent years, generating concerns among analysts and policy-makers about a looming debt distress threatening the region. World Bank (2004) reveals that the external indebtedness of African countries is an obstacle to the restoration of the conditions needed for growth. The huge debt burden acts as a threat to the economic performance given the wide spread poverty and structural rigidities in these countries. Raising the level of public external as well as domestic debt stock and debt service surely limits the ability of these countries to finance critical imports and new developmental projects, and hence it continues to be problem for poverty reduction aspiration.

## **1.2 Statement of the problem**

A large external debt burden is a major cause of poverty through its effect on economic growth and human development either directly or indirectly. The direct impact of external debt burden on poverty is through a channel of the crowding-out effect of debt service payments on social spending (on health, education, water, sanitation, and other essential social safety net services to the poor); and through a decline in net flows of external resources that could curtail poverty-related spending in the long run. On other hand, the indirect effect of the external debt burden on poverty is through curtailing the economic growth and hence private as well as public investment. Thus, this limited investment and constricted economic growth would increase uncertainties and reduce expenditures on economic infrastructure and hence affect poverty alleviation process.

A person can be considered poor if he or she is unable to secure the goods and services to meet these basic material needs. In addition to fulfillment of basic needs, the report includes risk, vulnerability, lack of autonomy, powerlessness, and lack of self-respect as an indicator of poverty. Poverty, in general, is defined as monetary which is proxied by income and consumption- that is to say a person below minimum income level, and non-monetary factors like health, nutrition, education, infrastructure, and wealth.

There is a substantive level of literatures on the relationship between poverty and economic growth but the links between external debt & poverty are complex, reflecting, among other

things, the multidimensional aspects of poverty. Many empirical evidences suggest that economic growth is the most powerful instrument for reducing poverty and improving the quality of life in developing countries Dollar & Kraay (2002), Gallup, Radelet & Warner (1998), and Adams (2003). It generates wealth, income, goods, and services, which when utilized and shared effectively reduce the country's poverty levels. A study by Dollar and Kraay (2000), which based on a sample of 80 countries covering four decades, found that, on average, the income of the bottom one-fifth of the population rose one-for-one with the overall growth of the economy as defined by per capita GDP. In contrast, although economic growth is the engine of poverty reduction, it works more effectively in some situations than in others. For any given increment in per capita income, the impact on poverty will depend on how that increment is distributed across the population (Ames, and Brian, et al, 2001). Thus, there is still an ongoing debate on the extent to which growth actually affects poverty.

There is, of course, long history to the debate on the relationship between economic growth and poverty. For instance, Lee, and Kwang-sun, et al (1997) found based on human development measurement of life expectancy, infant mortality rate, and primary school enrollment, the average income of a country is significantly and positively associated with progress on the human development for sub-Saharan Africa countries. Rain and others (2000) by suggesting two-way relationships between economic growth and poverty, found that better education and health increases economic growth. The other view focuses on reducing income inequality to combat poverty. Lower levels of inequality are found to have a direct, beneficiary impact on poverty reduction (Leite, Tsangarides, and Ghura, 2001). Thus, although growth affects the level of poverty positively, their effects vary significantly across countries in a given period and across periods in a given country (Revallion, 2001).

There are increasing empirical literatures that explore the effect of external debt on the growth of an economy. External debt is accumulated beyond a certain limit it could contract economic growth by hampering investment which is usually described by the debt overhang hypothesis. Outstanding debt ultimately becomes so large that the investment will be inefficiently low without sizable debt or debt service reduction, the burden of large debt sooner or later can lead to extreme scarcity in liquidity, negatively impacting upon capital formation, growth and

consumption. The incentive effect of the hypothesis refers to the low public and private investment because a larger and larger share of resources is transferred abroad for debt servicing.

The literature shows that the large of external debt has an impact on economic growth, which, in turn is found in the many studies to be a key determinant of poverty reduction. Hence external debt is likely to affect poverty through its impact on economic growth. However, the explicit link among indebtedness, growth, and poverty has generally been lacking in the empirical literature. This paper is an attempt to partially fill this void.

This study explore the link through which external indebtedness has an effect upon poverty, measuring by poverty headcount ratio, life expectance at birth, the child mortality rate and the primary gross enrollment rate. High debt service can directly reduce government resources that are available for the poor, for instance, health, education, and other social safety nets expenditure. Even if two countries constitutently have the same growth rate, the country with a high debt service is likely to spend less on provision of social service, thereby having a negative effect on none-income poverty indicator (Gupta, Verhoeve, and Tiongson, 2001).

### **1.3 Research questions**

Foreign borrowing by itself not a problem when properly utilized for productive investment and does not suffer from macroeconomic instabilities and policies that distort economic incentives. It may not also be a problem when economic growth is high enough to repay the debt as well as to finance additional investment demand. However, reckless borrowing and poor debt management system crowds-out investment and social safety net expenditures, thus adversely affecting poverty reduction efforts. This study explores and answers questions;

- a) What Patterns and changes SSA countries have experienced in external debt?
- b) How does external indebtedness, if any, affect poverty reduction in Sub-Saharan Africa?

## **1.4 Hypothesis of the Study**

It is difficult to pre-decide the impact of external debt on poverty reduction. It may have a positive effect if it is used to increase the welfare of the society, or it may have a negative effect on investment and economic growth and hence poverty reduction through the debt overhang and debt crowding out effect by discouraging investment and encouraging capital flight, and crowding out effect of debt service payments on social spending. This study hypothesizes that External indebtedness (debt service payment and stock of external debt) have effect upon poverty reduction in Sub-Saharan Africa countries.

## **1.5 Objectives of the study**

### **1.5.1 Major objective of the study**

This study investigated the impact of external debt on poverty in Sub-Saharan Africa.

### **1.5.2 Specific objectives**

- I. Describe the trend and change of poverty and external debt in SSA.
- II. Analyze the impact of external indebtedness on poverty in SSA.

## **1.6 Significance of the Study**

External debt magnitudes of larger proportion have been common in sub-Saharan Africa countries. And as a result of this, the burden of external debt has been a matter of great concern to the government of all nations in Sub-Saharan Africa countries. There are very limited literatures which studied on the effect of high indebtedness on poverty reduction in SSA countries case. Thus, there is dire need for a comprehensive study, exploring the link between external debt and its impact on the poor. This study attempted to fill aforementioned gap. Thus, its findings will be helpful for better understanding of the position of external debt in Sub-Saharan Africa countries and its effect on the poverty. The study generates evidences for policy implications and recommendations that aim to analyze the interaction of public external debt and economic growth and hence poverty. In addition, the paper draw practical policy conclusion which will be useful for policy makers, planners and researchers.

### **1.7 Scope of the study**

The study intends to analyze the effect of external debt on poverty in Sub-Saharan Africa countries. In order to capture the effect and its sustainability of external debt in the study area, thorough empirical investigation is conducted with data covering a period of 10 years i.e. 2008 – 2018. This period was chosen because in order to account recent time data and data availability of most Sub-Saharan Africa countries.

### **1.8 Organization Flow of the Study**

The remainder of the paper will structured as follows: next chapter will devoted to a brief review of theoretical issues and empirical evidences relating poverty and external debt. The data and methodology will be present in the third chapter. The final three chapters come out with the trends and changes of external debt in SSA, empirical findings, and conclusion and some policy implications.

## **CHAPTER TWO**

### **REVIEW OF THEORETICAL AND EMPIRICAL EVIDENCE**

## **2 INTRODUCTION**

The increment of massive external debt accumulation in advanced and least developing countries particularly in Sub-Saharan Africa countries has called theories and empirical analysis into evaluating the effect of external indebtedness on economic growth and hence on poverty, and its sustainability. This chapter will discuss former studies prepared by various scholars, authors, and researchers in the subject matter. The theoretical review of the study will be discussing in first section of this chapter. The second section will address the empirical literature on the external debt, growth and/or investment and poverty relationships. Final two sections of this chapter the study inspect evaluations of the theoretical and empirical literature in the context of SSA and conceptual framework of the study.

### **2.1 Theoretical Literature Review**

#### **2.1.1 Classical theory of debt**

The classical theory of public debt is closely associated with Adam Smith, Thomas Malthus, David Ricardo and Jean-Baptiste Say amongst others. The assumptions of classical theory are largely opposes to public borrowing as public expenditure is assumed as unproductive. This theory also believe in “laissez-faire” given that state interventions in the economy is assumed to be minimal and the government had to maintain only internal law and order, defend the country from external aggression, build diplomatic relations and look after some public works. The accumulation of debt by the general public sector is therefore considered unnecessary supported the idea of the Classical School that resources are managed more wastefully within the public sector compared to the private one. The state indebtedness is further considered by the classical economists as a distortion to non-public capital which reduces its productivity, thus impair the expansion and development of the economy.

Smith (1937) contrasting the accumulation debt by the state, arguing that the indebtedness of the public sector hampers the natural development of a nation towards wealth and prosperity since, it allows for diversion of productive private resources by the state into unproductive expenditure. The opinion of public debt by the classics is usually considered as cynical provided that public

borrowing, from the Classical viewpoint, is consistently wasteful. In response to the wasteful feature of public debt, Smith proposed balanced budgets, where all government expenditures are financed by taxation. He further described that budget deficits are often justified only in emergencies, especially during outbreak of wars or natural disasters. In such circumstances, Smith argues that the tactic of financing public expenditures through either taxation or issue of public bonds is crucial for capital accumulation to stimulate growth (Tsoulfidis, 2007).

According to classical theory of public debt approach the financing of public expenditures via borrowing is detrimental to the economy and to its wealth-generating capacity. The idea is that borrowing diminishes savings directly, that's to mention, the income able to be invested productively.

### **2.1.2 Keynesian theory of debt**

Keynesian theory of public debt is basically associated to the doctrine of Keynes (1936) and it is based on the assumption that government intervention in the economy is necessary because of the market failure. In response to the challenges of those times, especially the great depression the Keynesian doctrine attaches great importance to the government, whose interventions in economy is considered helpful in supporting the activities of the free market and correcting its market failure (Bilan, 2016).

The Keynesians opinion of public borrowing differed from the classical thoughts as they distinguish public borrowing as growth-enhancing due the expected turnaround associated with its investment in productive activities. Keynesians view of public borrowing tends offer opportunities for economic growth as governments is more committed to more value adding activities including public infrastructure and assume the task of countering disturbing economic and social phenomena. This is believed to add value to borrowed resources as ways of intervention to correct discrepancies and keep the economy on the track of growth. Keynes theory presented basis for government intervention in accelerating the pace of economic growth, in time of slow-moving growth. Bernheim (1989) perceived that many traditional Keynesians view of public debt need not crowd-out private investment as the increased aggregate demand enhances the profitability of private investments.

### **2.1.3 Indirect impact of external debt on poverty**

The previous studies show that the level of external debt has an impact on economic growth and on the level of investment, which, in turn is found in the many studies to be a key determinant of poverty. Thus, indirect impact of external indebtedness on poverty association can be analyzed through investment and growth.

#### **i. Disincentive effects**

Debt disincentive effect of public debt demonstrates the effect of debt on economic growth through investment. This hypothetical theory has extensive economic impression on economic growth and public borrowing relationship and its public debt sustainability. The debt disincentive effect can be described with the support debt overhang theory, liquidity constraint theory and debt-Laffer curve and these three models are widely used and influential. These theories confirm that there is non-linear association between public debt and economic growth and a theory of debt disincentive effect also demonstrate that at the very high level of debt lay a negative effect or disincentive effect on economic growth. Theoretically, it is simple to examine the impact of debt on economic growth and its sustainability using these models.

#### **ii. Debt Overhang Hypothesis**

The debt overhang hypothesis states that the debt overhang effects of public debt on investment. Debt overhang reduced investment due to a lower after-tax return affects the level economic growth negatively. Then any productive activity might be depressed as the earnings will be taxed away in the future to fill imbalances of the financing gap. Thus, the government may have lower motivations to accept challenging structural changes affecting the level and productivity of investment. Finally, a huge public borrowing may have negatively impact on main indicators of macroeconomic stability (fiscal budget deficit, inflation, exchange rate) increasing the insecurity of forthcoming investments. Increased insecurity of investment may also consequences from constant debt rescheduling negotiations which are dependent on a complex political process (Claessens/Detrage/Detragiache/Kanbur/Wickham 1996). Though, the level and efficiency of investment will lower with macroeconomic uncertainty.

According to Ajiya (1997) when indebted state's failed to pay back their debt based on the contractual agreement the disincentive effect on investment comes out. Thus, it is unimportant to measure the effect of debt overhang based on the quantity of debt accumulated. To maintain a

consistent and natural trend in production and investment, a ratio of high debt service to export should be paid back regularly. A country will get into numerous problems when heavy debt servicing because it put many countries on a fiscal deficit. . For example, a debt servicing may request an increase in tax to raise revenues and the expectation of a higher tax may dampen investment (debt overhang). Then payments are made using foreign exchange the most indebted countries transfer domestic resources to foreign exchange and to increase foreign exchange, countries might use aid income and this will in turn affect overall economic performance. When Poor countries faced a high debt service payment request, they might be forced to reduce expenditure on public investment and this in turn related to the crowding out effect of foreign borrowing.

In general due to a high debt service payment and a reducing in public spending growth will be curtailed. While debt overhang works mainly through economic growth, the income of the poor may be additionally influenced by these disincentive effects. This theory establishes a negative relationship between high debt and economic growth.

### **iii. Debt-Laffer curve**

Laffer curve was used as a tool to optimize tax revenue in order to eliminate or reduce the fiscal deficit. Given the rapid increase of public debt in recent decades, researchers in economics have examined the debt Laffer curve as an evaluation tool that lenders can use to assess the solvency of a debtor country.

Debt Laffer curve was analyzed first by Sachs (1989) in the context of debt overhang. He showed that in this case, debt forgiveness leads not only to maintain the current market value of securities, but also to increase expected value of monetary flows related to repayment of obligations of debtor countries. When a country is borrowing too much, its ability to finance decrease and thus the risk of default occurs. Creditors calculate the expected value of reimbursements they receive according to risk of default. If the expected value is less than the face value of the debt, reducing the nominal (or face) value of debt reduces the risk of default and leads to an increase in expected value of future repayments.

Krugman (1989) has shown that is a link between a country's ability to service debt and the current level of public debt. He showed that when a country accumulates too much debt, in other

words when payment obligations exceed its ability to pay, payment obligations act as a marginal tax rate: if the state succeed to obtain better results than those expected, benefits will return to creditors and not to the state. In these circumstances, the government may be discouraged to improve economic performances because the benefits are going rather to creditors than to country.

Starting from the idea that accumulated debt in current period must be repaid in the next period and future investment earnings will be capital outflows to creditors, Cohen (1989) showed that the debtor country benefits are very small and this leads to more debt to repay previously debts and to finance new investments.

Figure 1: Debt-Laffer curve

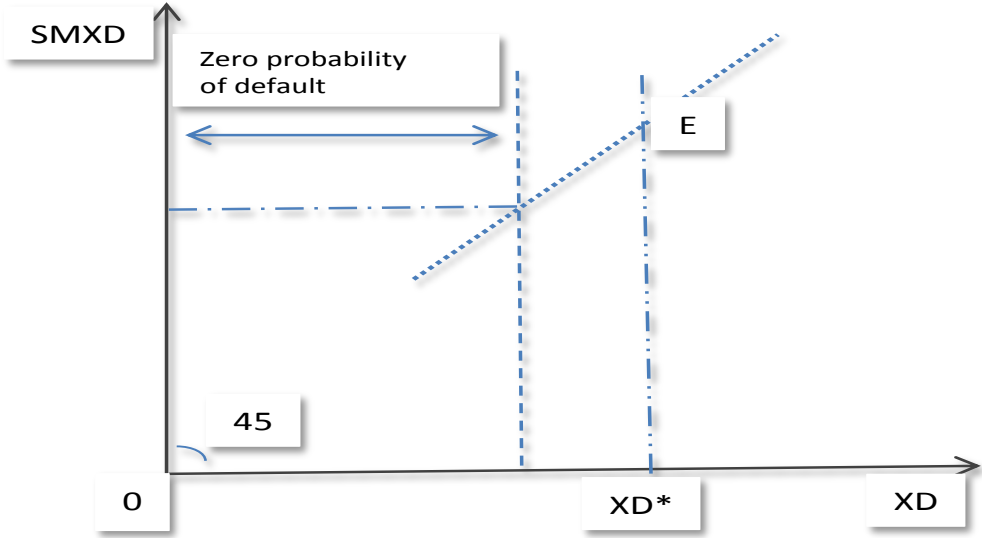


Figure outlines the relationship between the nominal value of external debt ( $XD$ ) and the Secondary market price of the external debt outstanding ( $SMXD$ ). When the debt stock is at lower level, the creditors assume that all the debt payments would be paid fully and it follows the 45- degree line up to a specific point here indicated as A. In this case, the value of  $SMXD$  would be unity.

Surpassing point A due to a further increment in  $XD^*$ , the default risk grows corresponding with the possibility of repayment falling beneath unity. Point E denotes the defining moment where  $XD^*$  (Nominal or contractual value of debt) and the risk of genuine default achieve a level that causes  $SMPED$  to decrease (Agénor, 2000).

On the correct hand side of point E, a nation is said to be on the wrong side of the Debt Laffer curve with expectations of lower repayments due to additional debt. Potential investors and creditors see this as a disincentive and subsequently investments decline intensely. This impact is sufficiently solid to guarantee that the market value of debt would increase when the stock of debt is decreased. To put it in another way, debt installments will increase when the amount used to debt servicing is decreased. For lenders, soothing part of the debt would be favorable as the capacity and possibly additionally the willingness of the indebted country to service its debt is prone to go up. Debtors then gain through decreased general debt and an encouraged creditworthiness and appeal as a reliable debtor that really benefits his or her debt (Woller and Phillips, 1996).

#### **iv. Liquidity Constraint Hypothesis**

Debt service (debt repayment) obligation is another channel through which external debt affects the level of economic growth. Debt service hypothesis describes that the requirements of external debt service reduce availability of resources for investment purpose. According to Hofman and Reisen (1991), a negative effect of debt service on investment would result in liquidity constraint. Economic performance can be affected through investment when a country exhibited with a higher stock of outstanding debt and a large amount of external debt service obligations. This is because large external debt accumulation and service could decrease availability of resources and lock off from external credit markets, thus it is expected that investments would decrease because of the decreasing in available resources for financing investment and macroeconomic conditions (Karagöl, 2002). In general, debt overhung and liquidity constraint hypothesis both imply an indirect negative impact on economic growth, via reductions in the level of investment. In contrast, the direct effect of debt hypothesis suggests that external debt affect the level economic growth via its influence on the productivity of investment (Ibid).

#### **v. Macroeconomic uncertainty**

If there is a macroeconomic uncertainty and instability because of high indebtedness the poor people may also be affected (Breen/Garcia-Peñalosa 1999). Higher uncertainty about future income increases precautionary savings which in turn increase poverty due to reduced growth. In addition, credit market effects, i.e. higher prevalence of credit rationing or increased risk premium and borrowing rates for private companies may affect negatively the poor through fall down labor demand (Agenor, 2002).

Propensity of debt crisis may also increase due to higher levels of external debt (Cohen 1997, 1998). Though a financial crisis in by itself may affect negatively on the poor (Baldacci/de Mello /Inchauste 2002), debt crisis may as well touch the income of the poor in the longer-run through disproportionate effects, that is poverty is less reduced in consequent expansions than increased during contractions. The decision of parent may not be reversed in expansions of diminishing the human capital of the poor to take children out of school to work during recessions. The Expectations also may be more cynical during stages of crisis than positive in growing times. Due to higher perceived risk of default in recessions the credits may also be rationed to firms. This effect may not fully counterbalance during expansions. The ability to smooth consumption with possible negative effects may also be prevented inadequate insurance and credit mechanisms for poorer households. Lastly, unskilled workers may lose their jobs first in recessions if firms reserve their skilled labor force due to higher turnover costs. If complementarity between skilled labour and physical capital is high, prominent to persistent unskilled unemployment companies may upsurge fixed investment during expansions (Agénor 2002).

#### **2.1.4 Direct impact of external debt on poverty**

Going one step further, there are hardly any papers that look at whether public debt or external debt has an impact on public investment in SSA.

#### **i. Debt crowding out hypothesis**

The crowding-out hypothesis expresses that higher current debt service obligations could crowd-out current public expenditure in productive activities because of reduced resources (Cohen, 1993). As public expenditure is a significant percentage of total domestic investment in most

evolving nations, lower public expenditure diminishes long-term growth through macroeconomic multiplier effects (Dornbusch 1989).

The crowding out effect of debt service payment on social spending is a possible channel. The High debt service can directly reduce government resources that are available for the poor, for instance, health, education, and other social safety nets expenditure. The assertion is that debt relief will lead to increase increased public expenditure on improving the access to and quality of health, education water, sanitation and other essential service to the poor. A key assumption is that an increase in social infrastructural spending leads to a better social outcome. Every country—rich or poor, developed or underdeveloped—undertakes public health spending with a single dominant objective: to improve the health of its citizens.

External debt dampens economic growth through effect on human capital development. Government public expenditure could be reduced by debt servicing. In addition, expenditure on social infrastructure such as education and health which are vital role for economic growth will be reduced. It is well recognized that access to good quality education and health delivery systems are necessary for producing quality human capital. Therefore, the accompanying risk of reduced human capital will sustained when a country's government reduces its annual spending on health and education. It diminishes the economy's productivity and after that growth rate. Moreover, increased debt burden confirms that short-term government revenue is used to service the debt, thereby refuting public spending into some sectors of the economy. Decreased private investment as a result of reduced public investment can lead to a reduced economic growth as some private investments are counterparts to public financing. Inadequate infrastructural services triggered by crowding out effect could lead to reduction in productive investment.

Liquidity and solvency is another important indicator to debt crowd out hypothesis. A liquidity constraint refers to the incapability of a nation to pay back its debts now in the amount initially contracted, due to lack of sufficient cash on hand to repay current requirements. Whereas, the solvency refers to whether the value of a country's liabilities exceeds the ability to pay at any time and this also includes of inability of country servicing its debt in the long run (Ajayi, 1991). If a country debt-service ratio and the debt-GDP ratio are high, the country will be illiquid and its ability to remain solvent will also be impaired. Therefore, the county needs to pursue accelerated

growth in order to reduce its debt problems, and more importantly, to break out of its low income status.

A liquidity constraint represents a crowding out effect of external debt. An increase in external debt servicing reduces funds available (export earning) and leaves less avenues for expansion of investments. It indirectly also affects a country's ability to borrow further from external resources, thereby, put pressure on domestic borrowing and leading to crowding out (Taylor, L. 1994). This liquidity constraint negatively affects a private investment as well a public and publicly guaranteed investments. The damaging impact of debt servicing on growth is attributable to the reduction of government expenditure, resulting from debt-induced liquidity constraints.

A liquidity constraint which arises from the increase in debt servicing requirements may shift the budget away from the social sector or public investment to meet debt obligation Fosu (1996). Fosu underlined that public expenditure is a major determinant of the economic activities in many functional sectors. He also argued that debt can additionally influence economic growth via its effect on the productivity of investment and decrease output growth by diminishing productivity and as a result of the adverse changes in investment mix. Thus, crowding out effect discourages capital investment and encouraging capital flight because of increase in tax expectation.

Debt burden affects the current flows of resources available to the country Claessens (1990). Because of the complementarities between private and public investment, the resources used to service debt may crowd out public investment and hence discourage private investment. As debt servicing demands higher resources, so the share of public expenditure will shrink as most governments cannot lower spending. When there is less public expenditure on basic infrastructure, private investment will also be discouraged. The firm demand of high debt service payments on the budget results in required reduction in public expenditure mainly reduced spending on education and health and private investments are also discouraged. This concept is related with the crowding-out effect which is common in most of highly indebted poor countries.

In order to refund external debt, countries are needed to convert the domestic resources into foreign exchange in which debt must be repaid. So the desperate demand for foreign exchange to

service debt often results in foreign aid resources and other foreign exchange resources being routinely and frequently diverted to finance debt service payments.

## **ii. Risk of investment**

Another direct external debt adverse effect on poverty is by increasing uncertainty. Agenor and Montiel (1996) explained a large public sector's external debt leads to uncertainty on the side of the private sector as to how this large debt stock will be serviced. Domestic agents will expect a lower rate of return on domestic private asset accumulation, if they expect that this large external debt will be financed through distortionary taxation or reduced levels of productive public expenditure. In the incidence of such uncertainty, the private firms are likely to suspend investment and pause until the uncertainty die out. This effect may "account for the behavior of private investment and capital flight in the highly indebted countries during the early 1980s" (Ibid, 1996, p. 462).

To summarize our discussion external debt impact on poverty, the study conclude that high external debt has negatively impact on the income of the poorest in developing and transitional countries. On other hand, low levels of external debt may also be growth enhancing; that is external debt promotes the income of the poor at low levels and diminishes the income of the poor at high debt levels. However, high external debt could affect country caring capacity level that government expenditure ability on health and education and other social safety net programs will curtailed.

## **2.2 Empirical Literature Review**

There are a number of studies which have been done by many economists and researchers to assess the nexus between external debt and economic growth in the case of both a single country and cross country analysis. In the case of explicit link between external debt and poverty, however, has generally been lacking in the empirical literature. In this section, the available empirical literatures are discussed by channeling through its effect on growth and investment and then to poverty and direct effect on human developmental indicators (health, education and other social safety net programs) classifying into two categories which are single country studies and cross country studies.

### 2.2.1 Single country studies

Saungweme and Mufandaedza (2013) investigate the effects of Zimbabwe's external indebtedness on poverty by using income per capita, external debt service-to-exports and external debt-to-gross domestic product ratios as well as human development indicators of mortality rate and school enrolment. The result of the study shows that external outflows of financial resources in the form of debt repayments deprive the nation of basic service provisions. External debt servicing adversely affects short run income per capita and worsens infant mortality rates as well as government's responsibility to ensure adequate provision of education, health and infrastructure is greatly compromised according to their study.

To determine the association between debt burden, growth and incidence of poverty in Nigeria over the period 1970-2011 Ekpo and Udo (2013) employed econometric methodology of co-integration. In the econometric model, elements of failing state comprising corruption, insecurity and ethnic violence were also included as explanatory variables. Again, the incidence of poverty was measured by the proportion of government spending on social services and income per capita. They were found that public debt is negatively related to growth and poverty reduction. The study however, suggested that expenditure on social services should be promoted. By using co integration and multivariate analysis Oyedele, Emerah and Ogege (2013), investigate into the impact of external debt and debt servicing on poverty reduction in Nigeria using data for the period 1980 to 2010. Their results indicate that both the external debt and debt servicing cause poverty in Nigeria and also finding suggests that government must mobilize domestic saving to exchange external debt.

Kemal (2001) explore the debt accumulation and its implications for growth and poverty in Pakistan. He shows that debt accumulation and debt servicing adversely affect the poor people. The study illustrates that even though debt burden as a percentage of GDP of Pakistan exceeds that of all the South Asian countries, but it still is not so high as to qualify for a debt write-off. The study also suggests some polices to reduce the foreign debt. Sheikh and Alam (2013) also analyzed the effect of external debt on poverty in Pakistan during the period 1985-2010. They found that through OLS regression, external debt and external debt servicing increases the level of poverty in Pakistan. Their findings show that the level of external debt and external debt servicing on poverty is positive and statistically significant.

Ramakrishna (2002) estimated a debt growth model in a co-integration framework on Ethiopia external debt situation. The researcher provided in the model as evidence is that debt overhang hypothesis as the country has been on the wrong side of the debt Laffer curve. The model used in the study show as there is negative as well as non-linear relation between debt and growth. The evidence also shows that fiscal balance, investments, and openness have influenced economic growth negatively (the exception being agriculture). These results support the cases for more debt relief and fiscal consolidation and efficient investment utilizations for Ethiopia during that time.

Barfour, (1995), in his study on Ghana, argued that debt repayment inevitably imposes constraints on a debtor country's growth prospective since it involves the transfer of resources to other countries. Therefore, in order to adequately appreciate the problem of indebtedness, it is essential to relate the debt with its repayments of some income resources generated by the debtor out of which the repayments could be made.

### **2.2.2 Cross country studies**

There are some cross country available empirical literatures but they were studied long time ago and focused more on external indebtedness and growth relationship.

The paper by Zaghdoudi and Hakimi (2017) investigates the impact of external debt on poverty for a panel of 25 developing countries over the period 2000-2015. Performing panel co-integration model, they found that there is strong evidence of a positive and significant long-run relationship between poverty, external debt, GDP per capita, gross domestic and fixed investment. Studies also detected existence of negative and significant association between external debt, poverty, infrastructure, health condition and openness.

Loko et al (2003) observe the impact of external debt on three human development indicators i.e. life expectancy, infant mortality rate, and gross primary enrollment rate for 67 low income countries for the period of 1985 to 1999. The study shows that the debt indicators have limited but not negligible impact on non-income poverty indicators.

Maier, R. (2005), explores a linear and non-linear impact of external debt on pro-poor growth in developing and transitional countries to reveal effects and consequences of high indebtedness on income poverty. He tested the distribution effect of external debt to GDP, external debt to

exports, and debt services to exports on the poorest 20 and 20 to 40 percent in a cross country approach and analyzed potential trade-offs between the impact of unsustainable external debt levels on poverty through overall economic growth and via distribution. He also test the poverty effects, by collecting an irregular and unbalanced panel of time-series cross-country data on the first and second quintile of 58 developing and transitional countries for the period 1970 – 1999. By doing so his results, though, do not indicate an optimal external debt level with respect to pro-poor growth, higher external debt levels are associated with negative effects on the level of the income of the poorest 40 percent without exhibiting any significant effects on the growth rates. His finding also conclude that debt relief may affect the poor positively, but seems not to be a sufficient policy instrument for improved growth rates of the income of the poorest.

Zaghoudi (2018) examines the relationship between external debt and human development for a panel data set of 95 developing countries observed during the period 2002 – 2015. By using a Panel Smooth Threshold Regression (PSTR) model developed by González et al. (2005), his estimation results show that the external debt and human development relationship is non-linear and characterized by the presence of an optimal threshold of external debt equals to 41.7%. Below this debt threshold, external debt has a positive effect on human development. However, above the debt threshold, external debt becomes detrimental to human development since HDI decreases by 0.01% when external debt ratio increases by 1%. The paper also suggests that countries are encouraged not to exceed this threshold to benefit from the leverage effect for low external debt regime, whereas for high external debt regime countries are compelled to reduce their external debt ratio to reach the optimal threshold, avoid the waste of highly remunerated foreign resources and knowhow to allocate them to the most productive sectors, and control their demographic growth.

Fosu (1999) studied the effect of external debt on the economic growth based on data of 35 sub-Saharan Africa countries for the period 1980-1990. By using augmented production function framework, he found that debt has a negative effect on economic growth. Also, a negative correlation between external debt and investment levels was detected.

Based on 48 sub-Saharan African countries for the period 1980-99, Lopez (2002) found that absolute social spending allocations are paramount in determining social outcomes. Thus a key

component of poverty reduction strategies in low income countries is for economies to focus on investing in people.

It is obvious that poverty is associated with poor health. However, the important part of studies is focused on the effect of poverty on health condition. Using a sample of 70 countries, Gupta et al. (2001) note that the relationship between public spending and the health status of the poor is stronger in low-income countries than in higher-income countries. Filmer and Pritchett (1999) provide a good survey of studies linking public spending with health outcomes. In their own work, they find that the two are very tenuously related. According to their results, doubling public spending from three to six percent of GDP would improve child mortality by only nine to 13%. Public spending has also had an impact once economy education level.

Fosu (2008) also explores the link between public health spending and external debt servicing by using panel data for 35 sub-Saharan African countries for the period of 1975-1994. The study finds that although actual debt servicing has little impact, a binding debt-servicing constraint that reflects the debt burden would shift expenditure away from health. Increases in external aid and constraints on the government executive tend to divert spending in favor of health, though; the debt-burden effect is dominant.

Education as a human capital indicator plays a crucial role in the development of countries. Nations cannot be properly developed without education. To study the role of education and income in poverty alleviation, Janjua and Kamal (2011) have used a dataset of 40 developing countries over the period 1999 to 2007. The econometric approach used in this study is the random effect generalized least squares (GLS) technique. First, they found that income growth plays a moderately positive role in alleviating poverty, but income distribution does not play a key role in poverty alleviation in the whole sample. Second, they reported that education is the most significant contributor to poverty alleviation.

A study by Akram (2016) investigates the consequences of public debt for economic growth and poverty regarding selected South Asian countries, i.e., Bangladesh, India, Pakistan and Sri Lanka, for the period 1975–2010. By using standard panel data estimation he developed an empirical model that incorporates the role of public debt into growth equations and the model is extended to incorporate the effects of debt on poverty. The results show that although public

debt has a negative impact on economic growth, neither public external debt nor external debt servicing has a significant relationship with income inequality, suggesting that public external debt is as good/bad for poor as it is for rich and result also show that domestic debt has a positive relationship with economic growth and a negative relationship with the GINI coefficient, indicating that domestic debt is pro-poor.

Iyoha (1999) by taking a simulation approach of econometrics study to investigate the impact of external debt on economic growth in sub-Saharan African countries using a small macro econometric model estimated for 1970-1994, he found the significance of debt overhang variables in the investment equation, suggesting that mounting external debt depresses investment through both a disincentive effect and a crowding out effect. Thus, the results demonstrate that debt forgiveness could provide a much needed stimulus to investment recovery and economic growth in sub-Saharan Africa.

To evaluate the relationship between external debt and economic growth, Gachunga (2018) applied panel data econometric techniques of Generalized Method of Moments. He found that economies of Sub-Saharan Africa are negatively affected by external debt. Also, external debt was found to be more deleterious to middle income economies compared to their counterparts low income economies.

Few studies have been able to determine how large the stock of external debt has to be for the debt overhang to have an effect. Clements Bhattacharya, and Quoc Nguyen (2005), using data for 1970–1999 for 55 low income countries, found that external debt slows growth only after its net present value reaches a threshold level of 20–25 per cent of GDP or 100–105 per cent of exports. These findings imply that the projected decline in external debt for the countries participating in the Heavily Indebted Poor Countries (HIPC) Initiative would directly add 0.8–1.1 per cent to their per capita GDP growth rates. Pattillo, Poirson, and Ricci (2002), in their study of 93 developing countries between 1969 and 1998, found that external debt began to have a negative impact on growth when its net present value exceeded 160–170 per cent of exports and 35–40 per cent of GDP. High debt appears to reduce growth mainly by lowering the efficiency of investment rather than its volume. It should be noted that the target debt level in the HIPC Initiative (150 per cent of exports in NPV terms) remains close to the estimated threshold above which the impact of debt on growth is likely to be negative. In other words, the HIPC

Initiative might reduce the level of indebtedness just to a level where a new increase in debt would have a negative impact on growth.

On debt sustainability and poverty study empiric by Babu, Kiprop, Kalio and Gisore(2014) using annual data of 1970-2010, they estimated the effect of external debt, as a share of Gross Domestic Product (GDP), on economic growth in East Africa Community (EAC) by employing a panel fixed-effects model. The findings suggest that external debt has a negative significant effect on per capita GDP growth rate in the EAC and a study also recommended reducing the external debt burden so as to promote rapid economic growth of the EAC member countries.

A paper by Akanbi (2016) also examined the rate of debt accumulation that limits the probability of debt distress based on a panel of 45 sub-Saharan African (SSA) countries over the period 1972-2012 using the dynamic probit estimation techniques. The results suggest that countries with poor governance rating can sustain a lower rate of debt accumulation while those with a good governance rating are able to sustain a higher rate of debt accumulation for a given probability of debt distress and the estimation result found that the sub-Saharan African countries' rate of debt accumulation is regarded as being unsustainable.

Recent fall in commodity prices, especially oil, the slowdown in China and the sluggish recovery in Europe, dependence on non-debt-creating flows, and accounting for contingent liabilities Sub-Saharan Africa government officials and policy makers need to pay attention to going forward (Battaile, Hernández and Norambuena, 2015)

A number of other studies have found the existence of debt overhang and crowding out effect in SSA when studying the relationship between debt vis a vis economic growth, investment, capital flight just to mention a few. However, direct relationship between indebtedness and poverty in sub-Saharan Africa countries general and country level in specific has lack of theoretical and empirical literature.

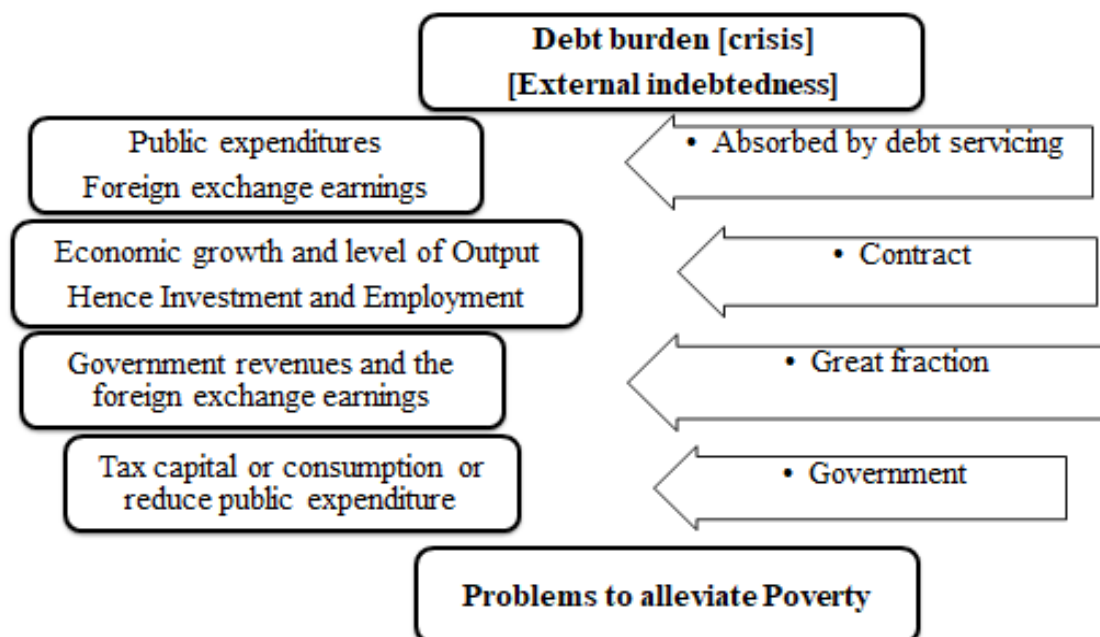
### **2.3 Conceptual Framework**

The study is going to analyze the effect of external debt and external debt service on poverty and assess its sustainability in Sub-Saharan Africa countries. Whenever a country is in a debt crisis, a large proportion of public expenditures and the foreign exchange earnings are absorbed by debt servicing. Investment activities have a propensity to reduce as the debt rises outside the safe

limits. When debt is accumulated beyond a certain limit it could contract economic growth by hampering investment which is usually described by the debt overhang hypothesis. A decline in the levels of investment results in reduction in the level of output, and the Okun law suggests that the employment would fall. The unemployment and poverty go side by side. Hence, poverty increases due to an increase in debt servicing. In other words, it can be said that in order to finance the debt servicing, a great fraction of government revenues and the foreign exchange earnings are used. The government of a debtor country either tax capital or consumption or reduce public expenditure in order to finance the increasing debt servicing requirement.

It is worth mentioning that each of abovementioned choices has momentous indication to boost the incidence of poverty. We explain mechanism in detail. Firstly, if government adopts the option of 'taxation of capital' to enhance the revenues with the aim of financing debt servicing, it would result in poverty. As the government increases the tax on incomes, aggregate private spending reduces that lead to fall in output and employment levels. Rise in unemployment levels hamper the nominal and real wage rates. This creates inequality and poverty in the indebted country. Secondly, if government adopts the option of 'taxation of consumption' instead of adopting the taxation of capital, it would also create poverty in the country. As the government increases tax on consumption, tax base would be enlarged but commodities used by the poor are also taxed, making the tax regressive. This implies that in this way the poor would be hit directly. Lastly, the government has an option of 'reduction of the public expenditures'. If government decreases the social spending on education, health and other social safety net programs due to high debt servicing, it would be bad for the economy in particularly for the poorer specifically countries in least developing country. The poor are hit directly due to fall in the social expenditure through decline in expenditure on means of transportation and communication, fall in labor-intensive construction activities, less investment activities, and fall in expenditure on social spending.

## Conceptual Framework



### 2.4 Evaluations of the theoretical and empirical literature in the context of SSA

Although there are very limited works of literature which studied the effect of high indebtedness on poverty reduction in SSA, in this subsection, the study will present a summary of related empirical studies and evaluations. A study by Loko et al (2003), examined the impact of external indebtedness on poverty using a panel data of 67 low income countries which includes all sub-Saharan Africa countries, over 1985-1999. Using the first-differenced general method of moment (GMM) estimator, they found that once the income on poverty has been taken into account, the external indebtedness indicators have only a limited but not negligible impact on non-income poverty indicators, such as life expectancy at birth and the infant mortality rate. However, the study was done long time ago and not considered the non-linearity effect of external debt on poverty.

Another study by Zaghdoudi and Hakimi (2017), investigates the impact of external debt on poverty for a panel of 25 developing countries over the period 2000-2015. By performing panel co-integration model, the study found positive and significant long-run relationship between poverty, external debt, GDP per capita, gross domestic and fixed investment. Findings indicate

also the existence of negative and significant association between poverty, infrastructure, health condition and openness. The study had done on developing countries thus it looks immeasurable that more specific region study level needed and non-linearity effect of external debt on poverty should be considered.

The literature confirms the coexistence of external debt accumulation and economic growth in most developing economies. However, empirical studies have focused mainly on the effects of external debt on growth, with little attention on the effect of debt sustainability on growth. Although a number of studies have investigated the impact of external debt on growth, the contribution of this study lies in investigating the effect of indebtedness on economic growth and poverty in SSA countries.

We can broadly summarize that only a few studies are available on the relationship between debt and poverty from the review of theoretical as wells as empirical literature, and most of them are low income countries level. A comprehensive study focusing on the impact of different macroeconomic policies incorporating public external debt is lacking. The proposed study intends to fill the gap by analyzing the impacts of public external debt on poverty.

## **CHAPTER THREE**

### **THEORETICAL AND METHODOLOGICAL FRAMEWORK**

#### **3. INTRODUCTION**

This chapter presents the theoretical framework and empirical model employed in this study to examine the impact of external indebtedness on poverty reduction in Sub-Saharan Africa. It also discusses the statistical tools and necessary diagnostic tests within panel regression and system GMM that are employed in this study.

##### **3.1 Data Source and Scope**

This study is used secondary data which drawn from World Bank (World Development Indicators and International Financial Statistics) and World Bank's Development Research Group databases (International Bank of Reconstruction and Development and International Development Association). The study covers a period of 12 years from the period (2007 – 2018) which captures the effects 2008 global financial crisis. However, data unavailability for some countries and years the study limited for choosing 40 countries and the time period of 12 years for the empirical analysis part.

##### **3.1.1 Description of the study area**

Sub-Saharan Africa is geographically and ethno culturally, the area of the continent of Africa that lies below of the Sahara dessert. The region is made up of forty-eight (48) countries. The region covers the total land area of 21,242,191 square kilometers and has an estimated total population of 1.1 billion in 2019 with annual average population growth 2.3 percent. The total GDP of the region in 2018 is 22,199.3 billion US dollar with annual average GDP growth rate of 4.36 percent from the period 2000 – 2018 and total GNI of the region is 1,121.4 billion US dollar with GDP per capita income 1,310.8 US dollar (WDI, 2018).

The income classification is based on a measure of national income per person calculated using the Atlas method. In 1978, the first World Development Indicator introduced groupings of low income and middle income countries using a threshold of \$250 per capita income as threshold between the groups. In the 1983 WDR, the middle income group was split into lower middle and upper middle groups, and in 1989 a high income country classification was announced. Since then, the thresholds to differentiate between the income groups have been adjusted for prices

over time. As of 2019, low-income economies are classified as those with a GNI per capita, calculated using the World Bank Atlas method, of \$1,025 or less in 2018; lower middle-income economies are those with a GNI per capita between \$1,026 and \$3,995; upper middle-income economies are those between \$3,996 and \$12,375; high-income economies are those with a GNI per capita of \$12,376 or more. Lower-middle-income countries and upper-middle-income countries are considered under middle-income countries and the GNI per capita range from US\$996 to US\$12,055 in the 2018 fiscal year.

The SSA region consists of twenty-three (23) low-income countries, nineteen (19) lower-middle-income countries, five (5) upper-middle income counties and one high-income country i.e. Seychelles. From the total of 48 countries in the region, however, due to unavailability of data on some important variables for some countries, annual data for 40 SSA countries were used in the study for empirical analysis. Data on external debt indicators and for other important variables for the remaining eight countries in the region are unavailable as a result excluding from the study. The empirical investigation based on 40 countries in the region expected reveals the external debt situation and effect on poverty in SSA.

### **3.2 Theoretical Framework and Basic Model Formations**

Theoretical association between external debt and poverty is not clear and it is complex. However, external indebtedness is likely to affect the level of poverty indirectly through its impact on economic growth and directly reducing government resource that are available for poverty related spending. The relationship between debt and poverty is possible to be both direct and indirect, and nonlinear, and their relationship is assumed implicitly to be presented in the models linking external debt to economic growth.

In order to assess the relationship between external debt and poverty reduction in this study a neoclassical production function is assumed, and then external debt variables will be incorporated to augment it. The production function is of the form given below:

$$Y = AF(K, L) \tag{1}$$

Where;

**Y**-denotes an economy's gross domestic product (GDP)

**K** -represents its share of capital

**L**-describes the amount of unskilled labor in an economy

**A**-represents a determinant level of technology

Above equation states that output growth can be enhanced by promoting are physical and human capital. Capital goods are mainly imported and some inputs are domestically produced through the investment process. The labor input is either skilled or unskilled labor. The supply of unskilled labor is not constraint in LDCs, given the huge unemployment pool.

Although the neoclassical production function explains variables which affect economic growth, the model does not consider the impact of debt burden on economic growth. But Cunningham (1993) revealed debt burden is a vital determinant of economic growth especially, for those who are developing and highly indebted economies. Foreign borrowings allowed a country to maintain domestic investment and economic growth and poverty reduction at levels beyond those that could be financed through domestic savings. Thus, external debt helps to finance development of both physical and human capital. However, it would affect negatively if it has been accumulated beyond country carrying capacity. Therefore, a debt augmented neoclassical production function is put thus:

$$Y = AF(K, L, E, Z) \quad (2)$$

Where

**E** = Public external debt indicators

**Z**= Variables that determines economic growth

Commencing the above theoretical perspective discussion, though absence of solid theoretical framework, one can draw an empirical specification of the debt-poverty model. This research estimate modifying the model prepared by Zaghdoudi, T., & Hakimi, A. (2017) to suit in this case.

In order to investigate impact of external debt on poverty first step, the impact of public external debt along with other control variables on economic growth will analyzed and, in the next step, the relationships of the variables with poverty indicators will be explored.

From abovementioned debt augmented neoclassical production function reduced form equations will take the following forms.

$$A_{it} = \beta_1 + \beta_2 D_{it} + \beta_3 X'_{it} + \epsilon_{it} \quad (3)$$

Assuming that higher and consistent economic growth leads to reduce the level of poverty, the relationship between real GDP growth ( $A_{it}$ ) and change in poverty can be written as,

$$P_{it} = \beta_1 + \beta_2 D_{it} + \beta_3 X'_{it} + \varepsilon_{it} \quad (4)$$

Where;  $i$  and  $t$  are country and time index respectively,

( $A_{it}$ ) GDP growth rate in a country  $i$  at  $t$  time

( $P_{it}$ ) represent the measure of poverty in a country  $i$  at  $t$  time

( $Y_{it}$ ) Per capita income in a country  $i$  at  $t$  time

( $D_{it}$ ) measure of external indebtedness in a country  $i$  at  $t$  time

( $X'_{it}$ ) is a vector of standard control variables that affect economic growth (performance) and hence the level poverty in a country  $i$  at  $t$  time.

Although the basic panel regression model represents the relationship between economic poverty and external debt, it does not show the nature of the relationship changes when the level of external debt increase. . The main aim of the paper is to find whether external debt plays a vital role in influencing poverty level.

### 3.3 Model specification

The main aim of this empirical investigation is to determine the relationship between external debt and poverty. First study will estimate growth rate of an economic in relation with GDP per capital and control variable. The study then incorporates poverty indicator of poverty headcount index and human development indicators to estimate the general econometric model for the study.

To find out the effect of external debt on poverty in sub-Saharan Africa countries we estimate the following equation model:

Growth model:

$$A_{it} = \beta_0 + \beta_1 gdp_{it} + \beta_2 gtcf_{it} + [\beta_3 exd\_gni_{it} + \beta_4 ds\_exp_{it} + \beta_5 ext\_exp_{it}] + [\beta_6 edu\_prim_{it} + \beta_7 child\_mort_{it} + \beta_8 health\_lexp_{it}] + \beta_9 trop_{it} + \beta_{10} infl_{it} + \beta_{11} no\_violence_{it} + \varepsilon_{it} \quad (5)$$

Based on the assumption of higher and consistent economic growth leads to a reduce level poverty, this study estimate modifying the model done by Zaghdoudi, T., & Hakimi, A. (2017) to suit in the case of the Sub-Saharan Africa countries. The estimated model will take the following form:

$$\begin{aligned}
pov\_hc_{it} = & \beta_0 + \beta_1 gdp_{it} + \beta_2 gtcf_{it} + [\beta_3 exd\_gni_{it} + \beta_4 ds\_exp_{it} + \beta_5 ext\_exp_{it}] + \\
& [\beta_6 edu\_prim_{it} + \beta_7 child\_mort_{it} + \beta_8 health\_lexp_{it}] + \beta_9 trop_{it} + \beta_{10} infl_{it} + \\
& \beta_{11} no\_violence_{it} + \varepsilon_{it}
\end{aligned} \tag{6}$$

To find out the effect of external debt on poverty in sub-Saharan Africa countries the study also estimate three standard human development indicators of life expectance at birth, under-five child mortality rate and gross primary school enrolment rate. The study estimates the modified model by Loko, B., and others (2003) to suit in this case. Equation model:

#### *Life expectance at birth*

$$\begin{aligned}
health\_lexp_{it} = & \beta_0 + \beta_1 gdp_{it} + \beta_2 gtcf_{it} + [\beta_3 exd\_gni_{it} + \beta_4 ds\_exp_{it} + \beta_5 ext\_exp_{it}] + \\
& \beta_6 trop_{it} + \beta_7 infl_{it} + \beta_8 no\_violence_{it} + \varepsilon_{it}
\end{aligned} \tag{7}$$

#### *Under-five child mortality rate*

$$\begin{aligned}
child\_mort_{it} = & \beta_0 + \beta_1 gdp_{it} + \beta_2 gtcf_{it} + [\beta_3 exd\_gni_{it} + \beta_4 ds\_exp_{it} + \beta_5 ext\_exp_{it}] + \\
& \beta_6 trop_{it} + \beta_7 infl_{it} + \beta_8 no\_violence_{it} + \varepsilon_{it}
\end{aligned} \tag{8}$$

#### *Gross primary school enrolment rate*

$$\begin{aligned}
edu\_prim_{it} = & \beta_0 + \beta_1 gdp_{it} + \beta_2 gtcf_{it} + [\beta_3 exd\_gni_{it} + \beta_4 ds\_exp_{it} + \beta_5 ext\_exp_{it}] + \\
& \beta_6 trop_{it} + \beta_7 infl_{it} + \beta_8 no\_violence_{it} + \varepsilon_{it}
\end{aligned} \tag{9}$$

### **3.4 Variable Description**

In this study, eight macroeconomic variables are used. They include the poverty, external debt, Real GDP per capita growth, gross fixed capital formation (capital, K), education levels, infrastructure, Health conditions and trade openness. All variables meet the international standard definition.

#### **1. Dependent variable**

The panel threshold model estimated in this study use poverty as a dependent variable. Empirical studies that investigated poverty external debt-nexus used poverty hand-count index, Per Capital GNP, Per Capital GDP corrected for Purchasing Power Parity (PPP) as a measure of poverty and as a dependent variable. This study adopts poverty hand-count index as a measure of poverty. Poverty head count ratios are highest in sub-Saharan Africa, indicating higher proportions of people living below the poverty line there than in any other region.

### ***Headcount index-pov\_hc***

By far the most widely-used measure is the headcount index, which simply measures the proportion of individual or households earning less than a given absolute level of real income--the poverty line, often denoted by **pov\_hc**.

Formally,

$$\text{pov\_hc} = \frac{\sum_{i=1}^N W(x_i \leq z)}{N} = \frac{N_p}{N} \quad (10)$$

Where; N is the total population and W (.) is an indicator-function that takes on a value of 1 if the bracketed expression is true, and 0 otherwise. So if expenditure ( $x_i$ ) is less than the poverty line (z), then W (.) equal to 1 and the household would be counted as poor.  $N_p$  is the total number of the poor.

## **2. Independent variables**

External debt-GNI, Debt service export ratio and Net total debt service are our main independent variable. The set of control variable encompasses GDP per capita, Gross fixed capital formation, school enrollment, primary (% gross), life expectancy at birth measured in years and openness (export plus import over GDP and as a proxy for level of country's interaction to the rest of the world).

### ***GDP per capita (constant 2010 US\$)-gdpc***

This paper used real GDP per capita as proxy for economic growth, which is the annual amount of real GDP divided by the total population. Per capita GDP reflects the level of economic growth. Growth and poverty relationship are not definitive. In some cases, economic growth leads to reduction in poverty. In other cases the effect can be negative and economic growth increases poverty. Results on the growth/poverty relationship are not definitive.

### ***Gross fixed capital formation (% GDP)-gfcf***

Gross fixed capital formation, consists of resident producers' investments, deducting disposals, in fixed assets during a given period. It also includes certain additions to the value of non-produced assets realized by producers or institutional units. Fixed assets are tangible or intangible assets produced as outputs from production processes that are used repeatedly, or continuously, for more than one year. Hence we expect that capital formation should have a positive coefficient in explaining economic growth and poverty reduction.

### ***Trade openness- trdop***

Openness is measured by the share of exports and imports in total GDP, measured at current price and expected to affect economic growth positively and hence poverty reduction. Romer, (1993) claimed that the countries have higher possibility to implement leading technologies from other countries if countries are more open to trade. In addition, Chang et.al (2005) emphasized trade openness promotes the efficient comparative advantage which allows the dissemination of knowledge and technological progress and encourages competition in the international market. Hence, the variable is expected to have a positive sign to poverty reduction.

### ***Political Stability and Absence of Violence/Terrorism-no\_violence***

It measures perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism. Instability in a country cause damage to assets or injures or detains people, particularly if these disrupt normal movement, business operations, and activity. This risk definition includes terrorism, which uses violence (or the threat of) to advance a political cause, and similar tactics used by "for profit" organized crime (World Bank).

### **Standard Human Development indicators to measure poverty**

The new perspective of the cause and manifestations of poverty have shown that poverty is a multidimensional phenomenon, and can be expressed in terms of income, and basic need such as access to health and education. Although the study will treat standard human development indicators as main independent variables for basic model, the research still perform fixed as well as Arellano and Bover (1995) and Blundell and Bond (1998) system GMM for each indicators by using selected macroeconomic variable in order to assess the effect of external debt on this standard indicators of poverty.

### ***Education-edu\_prim***

Education levels which is represented by gross primary school enrollment rate. It measures number of pupils (of any age) who are enrolled in primary education as a percentage of the total children of official school age population. Education has been found to be a significant factor in the promoting economic growth and reduction of poverty, improvement in income distribution and various dimensions of social, demographic and political development. It is also critical for achieving environmental and ethical awareness, values, and skills consistent with sustainable development and effective public participation in decision-making. Thus, growth in the value of

the indicator can be considered as a signal of improvement in school participation. Hence, the variable is expected to have a positive sign with respect to growth and poverty reduction.

### ***Health-health\_lexp and child\_mortality***

Health conditions in the economy represented by life expectancy at birth measured in years and child mortality- under five. Life expectancies at birth and child mortality rate are robust measurement of a country's health status. Life expectancy summarizes the mortality pattern that prevails across all age groups - children and adolescents, adults and the elderly. Under five-mortality rate on other hand expressed in terms of the number of children out of 1000 live births, dying before they turns to five. The lower life expectancy at birth and higher mortality rate-under five are usually the result of a combination of failures including poor nutrition, low immunizations rate, poor maternal health and educations. For this reasons they are powerful indicator of poverty and systemic health challenge.

### **External debt indicators**

#### ***External debt to GNI (a proxy variable for debt overhang) - exd\_gni***

This indicator measures the liabilities of the public sector for external debt of a country in relation to its total income (GNI). The disincentive effect or debt overhang effect of external debt on investment and growth from 1980's on wards is considered as one of the major cause for the poor performance of many developing countries. Although external borrowing is a method of supplementing savings and financing the investment gap in a country, an unsustainable debt burden will choke development. In general a higher ratio shows a higher debt burden; in this study we expect a negative impact from total external debt GNI ratio (exd\_gni) on economic growth and hence poverty reduction. Thus, coefficient expected to be negative to poverty headcount ratio.

#### ***Debt service to export (a proxy variable for debt crowding out) -ds\_exp***

The debt-service-to exports ratio is a possible indicator of debt sustainability because it indicates how much of a country's export revenue will be used up in servicing its debt and thus, also, how vulnerable the payment of debt service obligations is to an unexpected fall in export proceeds. When indebted poor countries transfer resources including foreign aid and foreign exchange resources to service their accumulated debt, there would be debt crowding out effect Krugman (1988) and Sachs(1989). The equivalent ratio which can trap the crowding out

effect is the total debt service export ratio (ibid). Thus the coefficient of (ds\_exp) is expected to be negative, caused by budgetary processes and external accounts effects

### ***External debt to export- ext\_exp***

The external debt-to-exports ratio is defined as the ratio of total outstanding external debt at the end of the year to the economy's exports of goods and services for any one year. This ratio can be used as a measure of sustainability because an increasing debt-to-exports ratio over time, for a given interest rate, implies that total debt is growing faster than the economy's basic source of external income, indicating that the country may have problems meeting its debt obligations in the future. The indicator shows the repayment capacity of its debt obligation of a country that a higher the ratio indicates country is facing the problem of incapability to paying back its obligation, whereas the ratio is lower and have stable growth country's debt is sustainable.

## **3.5 Econometric Technique**

In measuring an empirical investigation of the impact of external indebtedness on poverty, this study employs two different econometric methodologies, a system generalized method of moments estimation for a level and first-differenced equation as well as using random or fixed effects estimation.

In addition, the study estimates the impact by regressing poverty headcount ration on external debt indicators, standard human development indicators, and variant addition variables by using system GMM estimation. Bond et al. (2001) and Bunder and Bond (1998) have suggested to use the system GMM method to address the problem of simultaneous omitted variables bias means an issue of endogeneity. The paper jointly estimates the equation in level (6) and its first difference as a system for basic model with the restriction of having the same coefficient.

Instruments for first differences equation

Standard

**D. (gdpc exd\_gni ds\_exp ext\_exp gfcf)**

GMM-type

**L(1/11).(L2.pov\_hc L2.edu\_prim L2.heath\_lexp L2.child\_mortality)**

Instruments for levels equation

Standard

**gdpc exd\_gni ds\_exp ext\_exp gfcf**

GMM-type

**D. (L2.pov\_hc L2.edu\_prim L2.heath\_lexp L2.child\_mortality) (11)**

The GMM estimator is good estimator when the study has panel data and a dynamic model (it includes a lagged dependent variable as a regressor). The GMM dynamic panel estimators are appropriate for large N (40) and small T (12). The result of the system GMM estimation can be interpreted as a mixture of the level and first difference equation. In addition, the study will perform system GMM for each human development indicators of health and education on external debt indicators and other variant macroeconomic variable in order to assess the effect.

Thus, we apply a system GMM estimator using both information on the levels (cross country variation) and first-difference (within country variation) poverty indicating data (Arellano/Bover 1995, Blundell/Bond 1998). Estimating by pooled OLS, the estimated coefficients may also be biased and inconsistent due to unobserved country-specific effects in  $\epsilon_{it}$ . We use both a Hausmann test for fixed and random effects and a Breusch Pagan Lagrange multiplier test for random effects to cover this issue.

### **3.6 Data Inspection and Regressions Diagnostics**

The study will undertake some diagnostic tests to ensure that the estimated model does not suffer any biases within panel regression analysis. Pre-estimation test like unit-root test and post-estimation tests like normality, Multicollinearity, Heteroskedasticity, autocorrelation and Panel cross-sectional dependency tests and Sargan test were conducted. Unit root test was tested using Hadri LM test (2000) and Im-Pesaran-Shin (IPS) Test (2003). Multicollinearity test was conducted using Pearson correlation matrix for identifying a relationship between independent variables. Heteroskedasticity test for varying nature of the error variance and autocorrelation test for correlation between the error variance was conducted using modified Wald test for heteroskedasticity and Inoue and Solon (2006). Panel cross-sectional dependency test was conducted using Pesaran's (2006) cross-sectional dependence (CD) test and Friedman's (1937) statistic.

## CHAPTER FOUR

### PATTERN AND CHANGE OF EXTERNAL DEBT IN SUB-SAHARAN AFRICA COUNTRIES

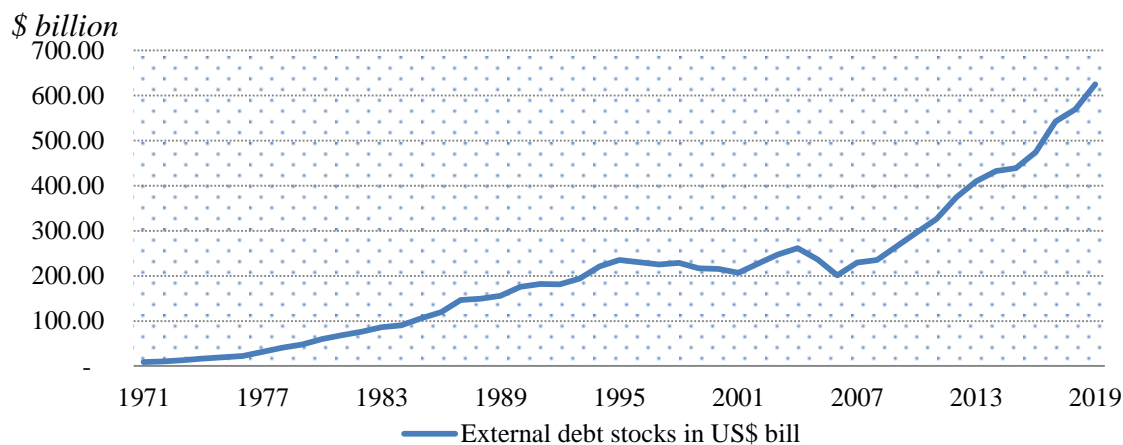
#### 4. INTRODUCTION

This section first presents the background of the indebtedness and debt crises, and then analysis the scope, nature severity of SSA's external debt.

#### 4.1 External debt Trend in Sub-Saharan Africa countries

External debt is money owed to external creditors who are multilateral creditors (International Financial Institutions) or bilateral creditors who are essentially other countries and commercial creditors (World Bank 2015). Countries in sub-Saharan Africa accumulated external debt a faster than low and middle income countries in other regions in a past decade. While external stock and external debt service have not returned to their per-HIPIC and MDRI incentives levels, they are greater than they were in 2005.

*Figure 2: Trends of stock of external debt in SSA countries*



*Source: World Bank's WDI (2020) and Author's Computation*

External debt stock in sub-Saharan Africa countries shows an upward trend. Fluctuation until 2007 was smooth and looks more linear. External debt stock as begun to rise consistently and continued on an upward trajectory since 2007. External debt stock rose by \$192 billion from 1971 to 2006, but since then it only required eight years to increase by \$204 billion. External

debt stock increased from \$10 billion in 1772 to \$235 billion in 1995, but between 1996 to 2001 stock of debt for this region declined from \$230 billion in 1996 to \$207 billion in 2001. From 2004 to 2006 stock of external debt has decreased by about 60 billion, though it was jumped from \$207 billion in 2001 to \$260 billion in 2004. In some countries, the increase was much larger. Between 2010 to 2019 external debt stock rose more than 200 percent in Cameroon, Ethiopia, Rwanda, Uganda and Zambia and more than 140 percent in Ghana, Kenya, and Liberia.

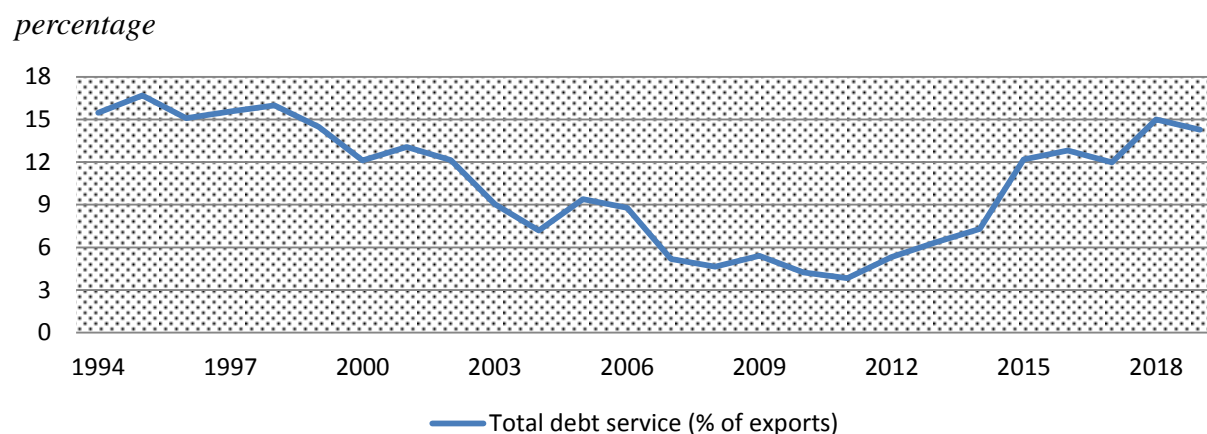
The combination of debt relief incentives and sustained growth performance in most countries in the region has seen a debt to GDP ratios reduced since the mid-1990s. However, this trend is starting to rise because of the falling number of countries that have benefited from debt relief since 2007, worsening fiscal positions and exchange rate depreciation, particularly for countries dependent on commodity exporters (IMF, 2018). While external stock and external debt service have not returned to their per-Heavily Indebted Poor Countries (HIPC) and Multilateral Debt Relief (MDRI incentives levels), they are greater than they were in 2005.

Increased debt stocks also raise the issues of debt sustainability, and as the most recent, publicly available IMF–World Bank debt sustainability analysis shows that several countries in the region including some that benefited from HIPC initiative, have a high risk of debt distress (International Debt Statistics, 2019).

#### **4.2 Total debt Service as the Percentage of Export in SSA Countries**

The debt service to exports ratio is used as an indicator of debt sustainability because it indicates how much of a country's export revenue will be used up in servicing its debt and how vulnerable the payment of debt-service obligations is to an unexpected fall in export proceeds. The higher the share of short-term credit is in the overall debt, the larger and more vulnerable the annual flow of debt service obligations. Debt service ratios may rise due to a fall in exports; fall in commodity prices, increased borrowing and higher interest rates.

Figure 3: Total debt service % of export in SSA countries



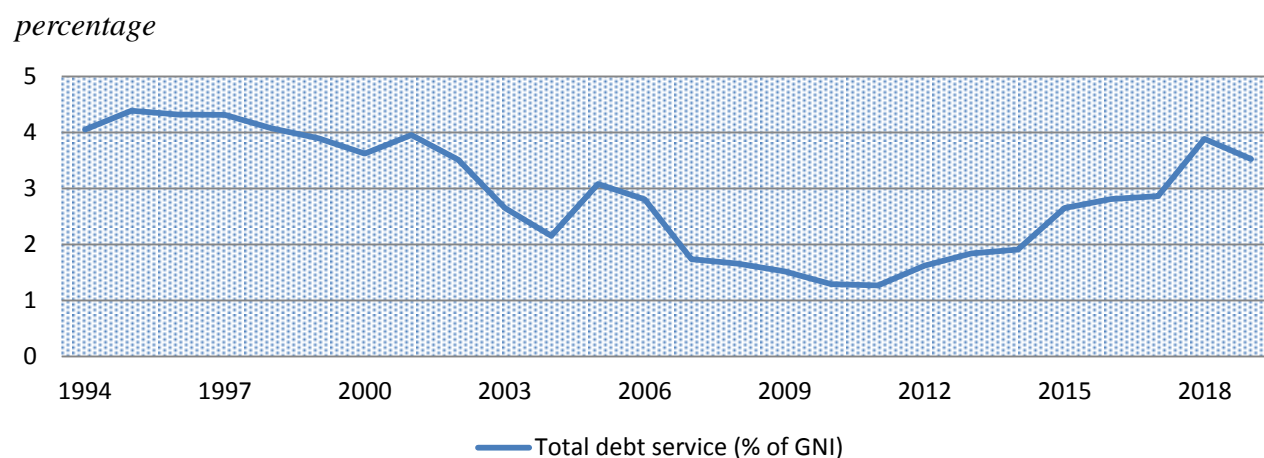
Source: World Bank's WDI (2020) and Author's Computation

The ratio of total debt service to export decline throughout the period between 1994 and 2011 and reached its minimum in 2011, which recorded 3.8 percent. Then, the ratio started to rise from 3.8 percent in 2011 to 14.3 percent in 2019, and this is because of the detonations of export earnings in the region. Increasing debt service-to-exports ratio over time, for a given interest rate, implies that total external debt is growing faster than the economy's basic source of external income, indicating that the country may have problems meeting its debt obligations in the future (IMF, 2000).

### 4.3 Total debt Service as the Percentage of GNI in SSA Countries

The external debt to GNI indicator measures the liabilities of the public sector for external debt of a country in relation to its total income (GNI). Although external borrowing is a method of supplementing savings and financing the investment gap in a country, an unsustainable debt burden will ultimately hinder development.

Figure 4: Total debt service % of GNI in SSA countries



Source: World Bank's WDI (2020) and Author's Computation

The total external debt stock as the percent of GNI is 4.4 percent before initiative that benefit from debt relief of Heavily Indebted Poor Countries (HIPC) and Multilateral Debt Relief (MDRI). However, after the initiative, the share of external debt stock to GNI amazingly reduced from 4.4 percent to 1.27 percent and the value reduced because of debt incentives. The value external debt as a percent of GNI in this region reached at the lowest level in 2011 that is 1.27 percent. After 2011 in sub-Saharan Africa countries, the share of external debt stock to GNI surprisingly increases from 1.27 percent in 2011 to 3.88 percent in 2018.

#### 4.5 External Debt Stock and its Components in the Region

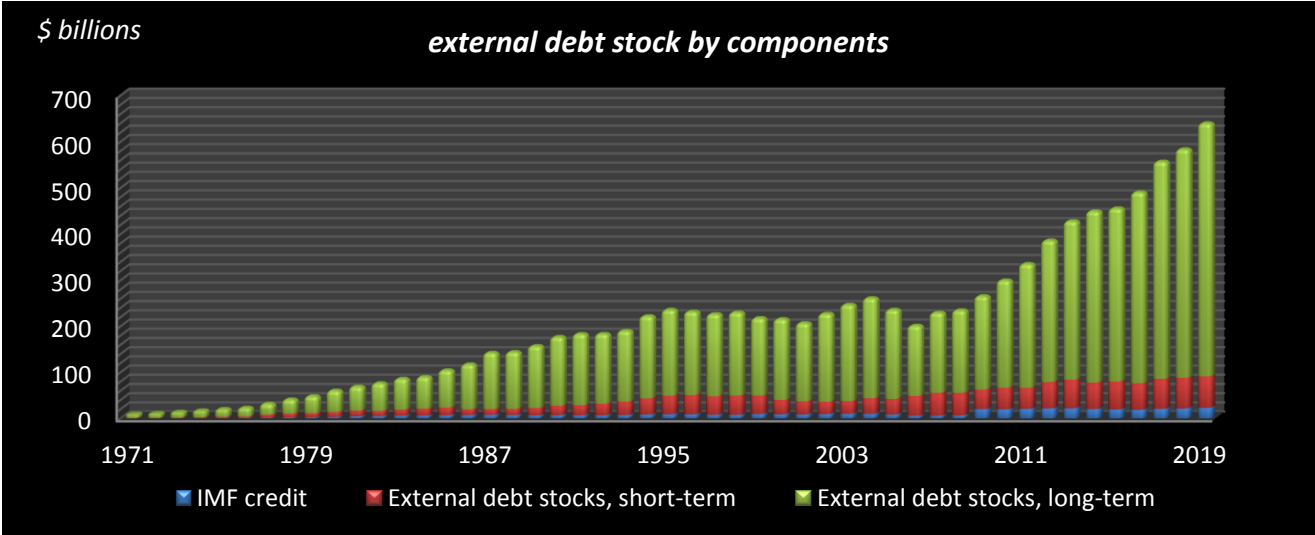
This section describes the compilation of the major components of external debt included in the International Debt Statistics (IDS) tables and database and the relationship between them.

The composition of total external debt is an influential factor in debt analysis since it has a direct effect on the processes of debt repayment, rescheduling, and relief. Total external debt shown in the IDS is the sum of long-term external debt, short-term debt, and IMF credit. It represents the total debt owed to nonresident creditors and is repayable in both foreign and domestic currency. Short-term debt is defined as external debt with an original maturity of one year or less.

The Debtor Reporting System (DRS) requires debtor countries to report only on their long-term external debt. However, to gain a comprehensive picture of total external obligations, the World

Bank encourages debtor countries to voluntarily provide information on their short-term external obligations. Long-term debt on other hand has an original maturity of more than one year. It comprises the obligations of both public and private debtors. Private nonguaranteed debt comprises the external obligations of private debtors that are not guaranteed for repayment by a public entity in the debtor country. Finally, IMF-credit-IMF trust fund operations under the Enhanced Structural Adjustment Facility, Extended Fund Facility, Poverty Reduction and Growth Facility, and Structural Adjustment Facility (Enhanced Structural Adjustment Facility in 1999) are presented together with all of the IMF’s special facilities (buffer stock, supplemental reserve, compensatory and contingency facilities, oil facilities, and other facilities).

Figure 5: External debt stock components in Sub-Saharan Africa countries

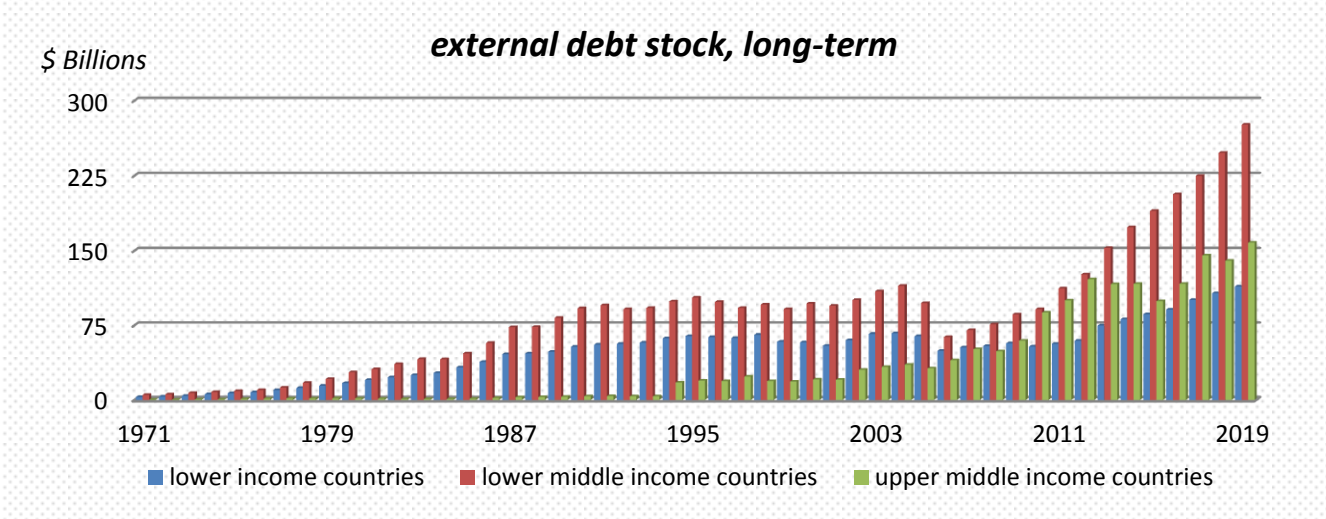


Source: World Bank’s WDI (2020) and Author’s Computation

The external debt sustainability of developing countries is affected not only the evolution of total debt stocks and debt-servicing burdens relative to their growth and export performances but also by the composition of their external debt (UN report, 2018). The above graph shows that in Sub-Saharan Africa the long-term debt remained the largest component of external debt stock. Long term external debt accounts for the lion share in all periods followed by short-term and IMF credit. Stock of external debt in SSA Countries from 2010-2019 was \$4,623 bill, of which long-term external debt account about 83 percent, short-term 13 percent and IMF credit 4 percent. All components stock of external debt in sub-Saharan Africa countries shows upward and more linear trend from 1971- 2004, but from 2004 to 2007 it decline. After 2007 external debt were

growing rapidly and rising long-term debt from \$174 billion in 2007 to \$5848 billion in 2019, whereas short-term external debt stock rise from \$49.5 billion to \$68.6 billion, and IMF-credit increases by \$17 billion. Growth of external debt in the sub-Saharan Africa countries is still high, and long term component of external debt growth is higher than both short term and IMF credit.

Figure 6: Long-term-External debt stock by region

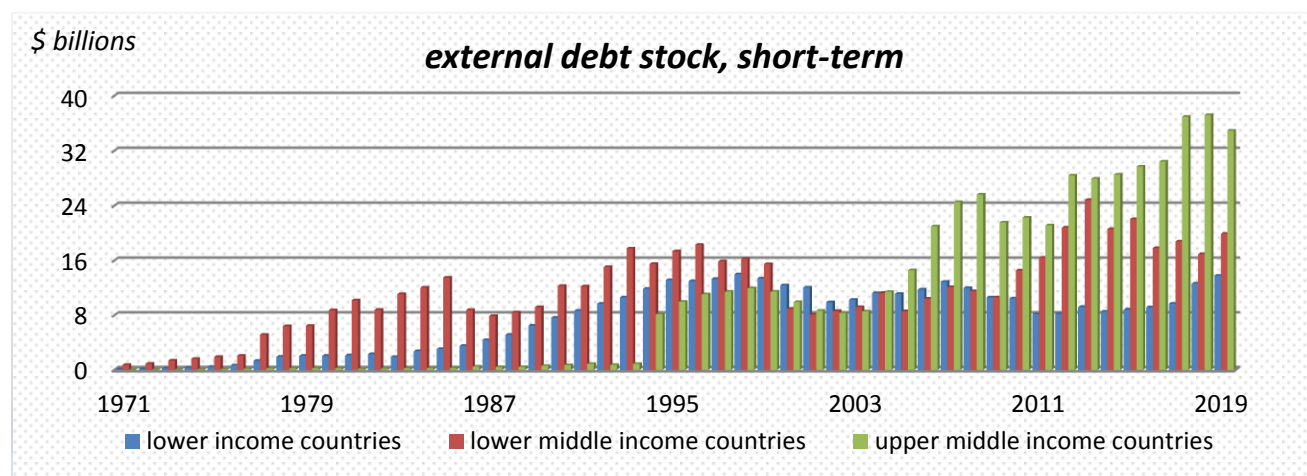


Source: World Bank’s WDI (2020) and Author’s Computation

Long-term debts on external debt in upper middle income countries in sub-Saharan Africa is lower than that of lower and lower middle income countries until 2000, but after 2005 this trend has changed and long term debt on upper middle income countries increases dramatically and surpass them. In lower income countries, before 1990 and early 1990s, there was a smooth growth of external debt on long-term. Since then the trend has changed and in year 1995 the rate of external public debt on long-term debt was 3 and in 2000 it was negative 5.3 percent. In the mid-1990s debt forgiveness under the Highly Indebted Poor Countries, Initiative (HIPC) reduced the debt burden in most African countries. Figure 6 also shows that in the early 2000s, external debt burden increased with a small amount; while this burden decreased in 2005 mainly because of debt forgiveness under Multilateral Debt Relief Initiatives (MDRI). Since 2010 SSA’s debt levels have increased and external debt on long term reached \$114 billion for low income countries of SSA in 2019. Generally, external public debt is very high in lower-income SSA countries.

The composition of external debt on long term debt and its trend in lower-middle income countries is the same as in low-income countries, but the level of debt always above lower income countries. Since 2007, the growth of external debt in this region was steep upward and it just took a decade to triple its value to reaches \$276 billion. Upper- middle income countries long-term external debt on the other side has been increasing since 1990, but between 2012 to 2015 it show slight declines. In 1990 long-term external debt in the region was just \$3.7 billion, but this amount has increased to \$39.9 billion in 2006 and \$158 billion in 2019.

*Figure 7: Short-term-External debt stock by region*



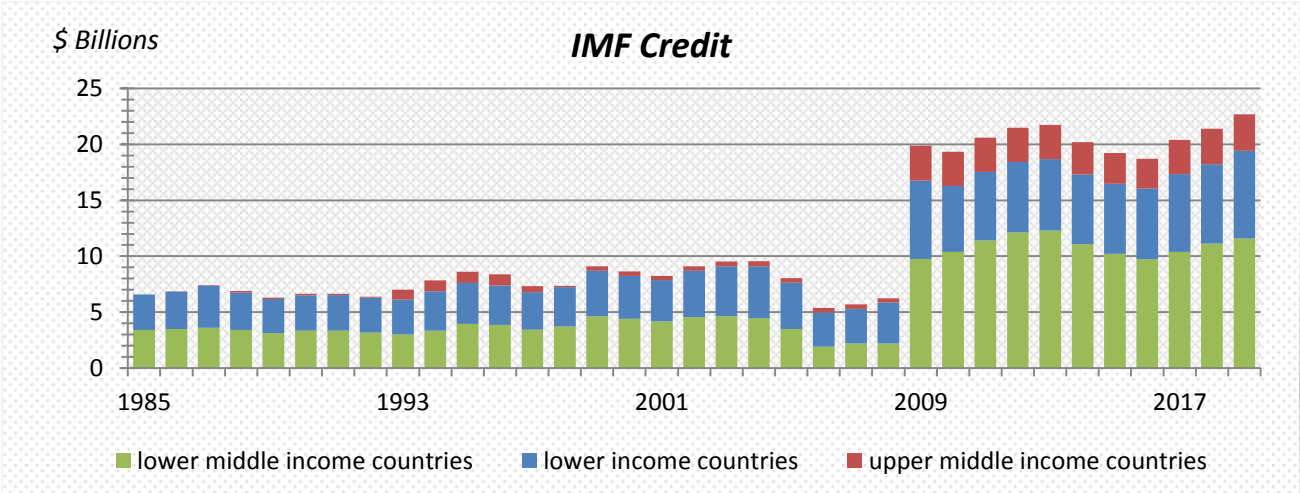
*Source: World Bank's WDI (2020) and Author's Computation*

Trends and growth of composition of short term debt on external debt was roughly similar with long-term debt in all regions. The short-term external debt has shown very diverse trends across the regions. Upper- middle income countries has experienced a trend increase in the short-term external debt, reaching above \$12 billion in recent years, consistently highest among the regions, suggesting a higher possibility of liquidity risk at a regional level. A low-income country has reduced its short-term external debt from above \$14 billion in 1998 to about \$9.5 billion in 2017. However, lower-middle income countries had a consistently shows unstable growth of external debt on short term debt until recent years. The variable stock of external debt of short term debt for low-middle income country and upper- middle income has doubled over the last ten years, reaching above \$20 billion in recent years, suggesting a higher possibility of interest rate risk at a regional level.

Figure 8 below indicates IMF credit to lower and lower middle income countries was roughly similar to until 2008. Starting from the year 2009 to 2019 a large increment in IMF credit was recorded for both regions. Upper middle income countries the share of IMF credit has been very small, but in 2010 it turned to \$3.2 billion from \$0.4 billion in 2009 and since then the growth has been stable.

In 1995, IMF credit to lower income countries, lower-middle income countries and upper-middle income countries in Africa reached \$ 3.6 billion, \$3.3 billion and \$1 billion, respectively. Since then the trend has not changed significantly until 2004. In 2005, because of Multilateral Debt Relief Initiative IMF credit in all regions has declined as shown in figure below. This fallen has continued till 2008. In 2009, but IMF credit component of external debt stock increased rapidly more specifically in all regions and reached \$7 billion for lower income countries, \$10 billion lower-middle income countries and \$3 billion for upper-middle income countries.

Figure 8: IMF-Credit by region



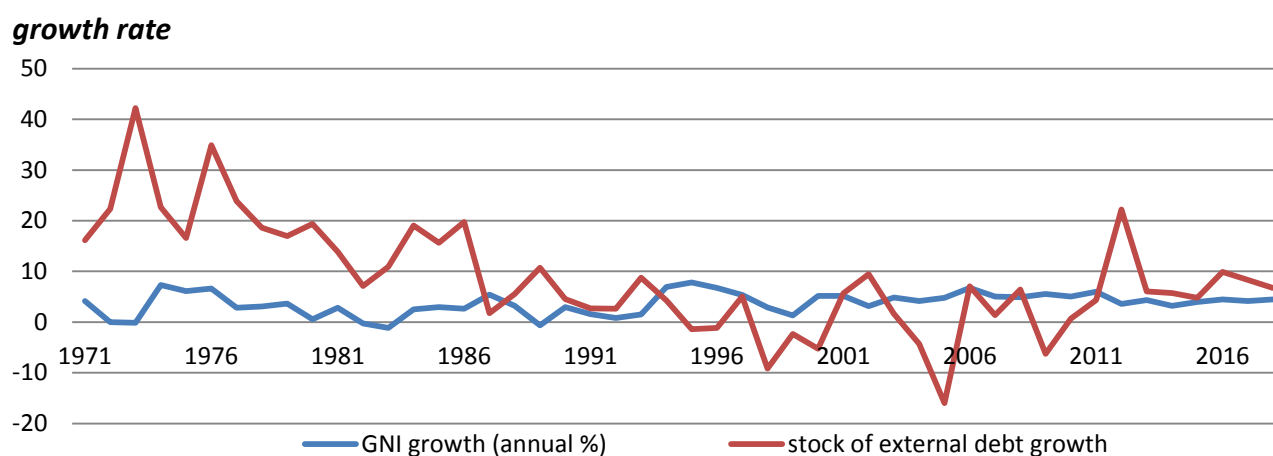
Source: World Bank's WDI (2020) and Author's Computation

## Growth of GNI and stock of External debt

### *Low-Income SSA Countries<sup>1</sup> Economic Growth and Debt*

GNI growth rate for SSA associated with relatively less fluctuating rate of public external debt throughout 1970 to 2019. Since 1995 stock of external debt growth in this region was fluctuating highly. Contrary to 2005 negative 16 percent growth, in 2015 it was 22.2 percent. However, fluctuation of GNI growth in this region was small, and since 2000 growth rate was always between 3 and 6 percent. The rate of stock external debt shows increment from the year 2010 to 2019. Bernardin (2018) explained that even though many countries in the developing regions have managed to restore growth fortunes after the global economic distress of the 1980s, stagnation persisted in SSA into the first half of the 1990s due to the burden of external debt.

*Figure 9: External public debt and GNI growth of low-income SSA*



*Source: World Bank's WDI (2020) and Author's Computation*

The drastic decline in external debt rate starting from 2001 was on account of many SSA countries subscribing to debt relief under the highly indebted poor countries (HIPC) initiative. The improved growth performance witnessed following the declining debt burden could be indicating the increment of additional resources through reduced external debt service obligations to push growth.

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<sup>1</sup> \*List of Low-Income SSA Countries: Central African Republic, Gambia, Malawi, Niger, Somalia, Uganda, Burkina Faso, Chad, Eritrea, Guinea, Mali, Rwanda, South Sudan, Burundi, Congo, Dem. Rep., Ethiopia, Guinea-Bissau, Liberia, Madagascar, Mozambique, Sierra Leone, Sudan and Togo.

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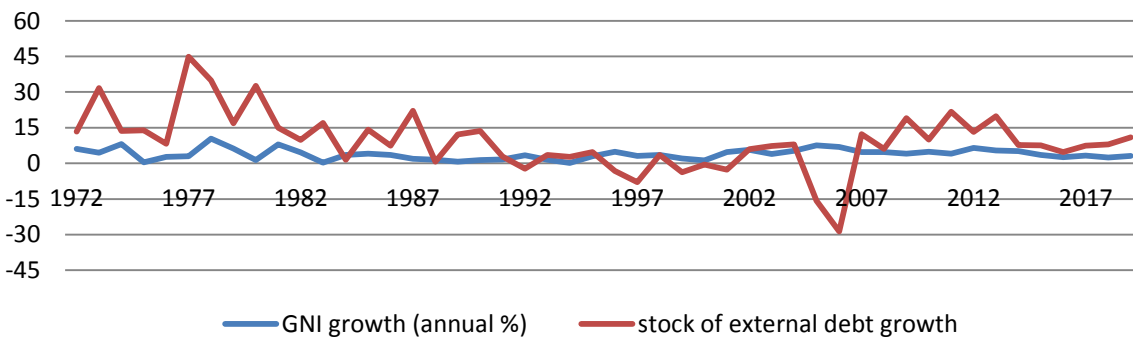
### *Lower-Middle-income SSA Countries<sup>2</sup> Economic Growth and Debt*

By the late 1990s, most countries in lower middle-income countries of SSA adopted the Highly Indebted Poor Country (HIPC) initiative and were being relieved of their external debts. Between 1992 and 2006, external debt growth rate fluctuated very highly, while GNI rate of growth was relatively stable. In 1992 external debt growth was at negative 2 percent, but this percent has further declined and reached its minimum level at 2006 that is 28 percent.

By the end of 2007, external debt growth increased to 12.3 percent from 2006, GNI growth also increased to 4.8 percent from the same period. GNI growth rose from 24.82 percent to 33.93 percent while external debt growth significantly decreased from 5.99 percent to -25.74 percent from the period 2004 -2006 because of MDRI. Since 2006, growth rate of external debt stock has begun to rise consistently from negative 25.74 percent in 2006 to 12.71 percent in 2017. However, GNI growth rate highly fluctuates in over the period, which recorded -19.02, -11.24 percent, 20.69 percent, 12.25 percent and -10.32 percent in 1993, 2009, 2010, 2013 and 2016 respectively.

*Figure 10: External public debt and GNI growth of low-middle income SSA*

*growth rate*



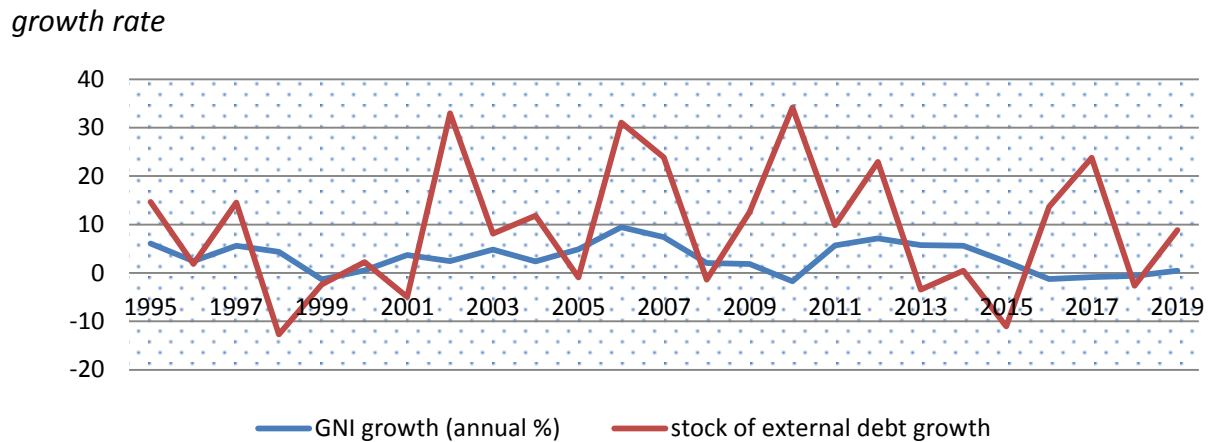
*Source: World Bank's WDI (2020) and Author's Computation*

<sup>2</sup> *\*List of Low middle-Income SSA Countries: Benin, Cabo Verde, Comoros, Djibouti, Eswatini, Mauritania, Zambia, Senegal, Papua New Guinea, Kenya, Ghana, Congo, Rep., Angola, Cameroon, Cote d'Ivoire, Lesotho, Nigeria, Tanzania, Zimbabwe.*

### *Upper-Middle-income SSA Countries<sup>3</sup> Economic Growth and Debt*

Growth rate of stock of external debt for upper-middle income countries in SSA shows that in table 11 below, it has been fluctuating throughout year for the period under consideration from 1995-2019. However, GNI growth has been smooth and shows similar patterns in the whole period.

*Figure 11 External public debt and GNI growth of low-middle income SSA*



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<sup>3</sup> \*List of upper-middle-Income SSA Countries: South Africa, Gabon, Botswana, Equatorial Guinea and Namibia

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## **CHAPTER FIVE**

### **EMPERICAL RESULTS AND DISCUSSIONS**

#### **5 INTRODUCTION**

The effects of external debt on poverty reduction in Sub-Saharan Africa are presented in this chapter. The empirical analysis uses annual data on 40 Sub-Saharan Africa countries for 12 year period (2007-2018). In first section of this chapter the study will presents descriptive statistics of variables used in the model. The second section reports the outcome of diagnostic tests conducted. In the third section results from the estimated model and are present and discussed, and last section will conclude chapter.

#### **5.1 Summary statistics and Description**

The descriptive statistics considered the mean, standard deviation, maximum and minimum values of the dependent and independent variables. The statistics are based on 40 Sub-Saharan Africa countries out of the total of 48 countries in the region due to the unavailability of data for some countries in relevant variables. The mean represents the average value of the variables whilst standard deviation indicates how variables are distributed around their mean values. Table 1 shows the descriptive statistics of the variables.

The poverty headcount index for 40 Sub-Saharan Africa countries used in the empirical analysis averaged 40.2 ratios i.e. portions of people living below poverty line between 2007 and 2018 ranging from 0.12 ratios for Mauritania in 2017 to positive 94.3 ratios for Democratic Republic of Congo in 2007 with a standard deviation statistics of 20.76. This growth variation among countries in the region may be because of occurrences in domestic and external factors such as political unrest, weak administration system, and continuous deterioration in terms of trade, global economic downturn and financial crisis in the international economies.

Based on table 5.1 below, the average of each country's GDP per capital varies by US\$ 2,313.88 from the mean of US\$ 2,063.3. The maximum GDP per capital is US\$ 9,521.29 for Gabon in 2015 whereas the minimum GDP per capital is US\$ 273.49 for Ethiopia in 2007. This higher variation of GDP per capital implies that SSA countries have heterogeneous income earning during the study period.

The stock of external debt in percentage of GNI in the region remains high averaging 28.22 percent for the period 2007 to 2018. The minimum level of external debt stock as a percent of GNI stood at 4.17 percent for Botswana in 2007 whilst the maximum value recorded at 309.97 percent for Liberia in 2007. This is an indication that some countries in the region heavily dependent on the external financial source to fill their financial gaps, and their variation in the external public debt-to-GNI ratio resulted from the investment and other related policies they adapted as a way to reduce external borrowing and to promote economic growth.

From table 1 below it is possible to understand that the debt service-to-export ratio has little variation of (standard deviation) 5.89 from the mean of 6.95 of the observation. There is a minimum amount of the ratio of debt service and export earnings in those countries as a result; external public debt is highly accumulated. Countries with high debt burden and currency not tradable in the international market require enough inflow of foreign exchange to service the debt. A situation where a country has low exports and capital inflows as well as inadequate reserves, debt servicing becomes a problem to economic growth. Similarly, the ratio of external debt to export in the region remains low, but increasing averaging 1.6 for the period 2007 to 2018. External debt compared to export increasing recently that for a given interest rate, many countries have been facing the problems of meeting its debt obligations. [See more Appendix 1]

*Table 1: Summary Statistics*

<i>Variable</i>	<i>Obs</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Min</i>	<i>Max</i>
<i>pov_hc</i>	480	40.22	20.76	0.12	94.30
<i>gdpc</i>	480	2,062.30	2,313.88	273.49	9,521.29
<i>exd_gni</i>	480	35.91	28.22	4.17	309.97
<i>ds_exp</i>	299	6.96	5.89	0.50	34.90
<i>ext_exp</i>	463	1.59	1.55	-	15.73
<i>edu_prim</i>	374	102.80	21.40	43.31	149.31
<i>heath_lexp</i>	480	59.55	5.62	40.70	72.78
<i>no_violence</i>	480	31.37	19.91	0.95	88.63
<i>child_mort~y</i>	480	82.71	30.48	15.80	183.20
<i>gfcf</i>	480	23.43	8.30	3.29	54.30
<i>trade openness</i>	480	70.66	29.42	20.72	311.35
<i>inflation</i>	470	7.11	7.20	-8.97	63.29

*Source: World Development Indicator, World Bank Group-iresearch databases and Author's calculations (2020)*

As per table 1 above, the average gross fixed capital formation as a percentage of GDP is 23.43 percent from the period 2007 to 2018. The ratio is ranging from a minimum value at 3.29 percent for Zimbabwe in 2008 to the maximum value at 54.3 percent for Guinea in 2016. The standard deviation of the variable is 8.3 percent.

According to the summary statistics table 5.1, the mean value of the trade openness in the region is 70.66 for the period 2007 to 2018. The minimum and the maximum value of this variable is 20.7 for Nigeria in 2016 and 311.3 for the Liberia in 2000 respectively. This variation from the mean value indicates that there is enormous difference within the region to embrace the efficient comparative advantage which allows the dissemination of knowledge and technological progress and encourages competition in the international market

The summary of primary school enrollment rate in the region of SSA indicates that the average of pupils at any age who enrolled in primary school in gross is 102.8, whereas standard deviation is 21.4 indicating that there is high variation within the region. The rate of enrollment is ranging from a minimum value at 43.3 for Eswatini in 2007 to the maximum value at 149.3 for Rwanda in 2009. The average of life expectancy at birth, which displays the mortality pattern that prevails across all age groups, in the region varies by 5.6 from the mean of 59.5. Eswatini recorded lowest life expectancy at birth in 2018 that is 40.7 from the region under the period study consideration of 2007 to 2018, whereas Cabo Verde recorded highest by 72.8.

Based on table 1 above, on average number of children out of 1000 live births, dying before they turns to five in the region varies by 30.5 from the mean of 82.7. The minimum under- five child mortality rate stood at 15.8 for Cabo Verde in 2018 whilst the maximum rate recorded at 309.97 for Sierra Leone in 2007. This is an indication of there is huge variation of child mortality rate within the region.

## 5.2 Regression Diagnostics Test Results

### 5.2.1 Panel unit root test

Although unit root test is generally considered as time series phenomenon, testing stationarity for panel data sets have greater power and advantage than time series stationary test. Non-stationary data has often been regarded as a problem in the empirical analysis. Working with non-stationary variables may lead to spurious regression results, from which further inference is meaningless. This study used Hadri LM (2000) and Im–Pesaran-Shin (2003) unit root tests because these two tests are valid when the number of time periods (years in this study) is small and the number of individuals (country in this study) is large. Hadri LM test is based on within estimation and allows non-normality. Im-Pesaran-Shin (IPS) test is more general than LM and it is based on the combination of independent Dickey-Fuller tests besides IPS allowing heteroskedasticity, serial correlation, and non-normality.

*Table 2: Panel unit root test*

Variables	<i>Hadri LM</i>		<i>Im-Pesaran-Shin</i>	
	<i>t-statistic</i>	<i>p-value</i>	<i>z-statistic</i>	<i>p-value</i>
<i>pov_hc</i>	-3.5087	0.0002	-4.3286	0.0000*
<i>gdpc</i>	-2.6474	0.0041	-5.6384	0.0000*
<i>exd_gni</i>	-7.4670	0.0000	-8.1760	0.0000*
<i>ext_exp</i>	-16.6249	0.0000	-8.1532	0.0000*
<i>heath_lexp</i>	-28.3357	0.0000	-8.2623	0.0000
<i>no_violence</i>	-4.0391	0.0000	-1.5845	0.0565
<i>child_mort~y</i>	-8.8678	0.0000	-7.8261	0.0000
<i>gfcf</i>	-7.6246	0.0000	-2.8695	0.0021
<i>trade openness</i>	-5.2041	0.0000	-7.7800	0.0000*
<i>inflation</i>	17.0650	0.0000	-3.7580	0.0001

Source: Authors computation from the WDI (2020), Word Bank Group-iresearch databases. The null hypothesis is non stationarity and the alternative hypothesis is stationarity. \* indicate that the tests are statistical significance at I(1) (first difference) whereas others were statistical significance at a level I(0).

As per table 2, the result of Hadir LM panel test statistics showed that the all variables; GDP per capital, all debt indicators, all human development indicators, gross fixed capital formation to GDP, trade openness, and inflation were stationary at level. Whereas, Im-Pesaran-Shin indicate that five variables such as life expectance at birth, absence of violence, under-five child mortality

rate, gross fixed capital formation and inflation were stationary at level but the rest were stationary after the first difference.

### **5.2.2. Test for Heteroskedasticity**

The homoskedasticity assumption states that the variance of the unobservable error,  $u$ , conditional on the explanatory variables, is constant. Homoskedasticity fails whenever the variance of the unobservable changes across different segments of the population, which are determined by the different values of the explanatory variables (Wooldridge, 2004). The presence of heteroskedasticity in this study is tested using the Modified Wald test for GroupWise heteroskedasticity and the result is presented in the Appendix 2. The result of the heteroskedasticity test in fixed effect regression model indicates the presence of heteroskedasticity as the null hypothesis of 'homoskedasticity' was rejected at the 5 percent level of significance. Thus, the problem of heteroskedasticity is corrected by re-estimating the fixed effect model with robust standard errors. [See Appendix 2 for detail]. Hence, our data is not free from heteroskedasticity.

### **5.2.3 Hausman Specification Test**

Under this section we carry out some diagnostic tests to examine which estimation technique fits the model and the data well. Hausman Specification test used to choose between the fixed effect and random effects model. Panel data models examine fixed and/ or random effects of group of time. Hence, our data should have individual effects or time effects. In order to examine the presence of individual effects and/or time effects, it is required to perform either fixed effects or random effects test. For model of main, growth, life expectancy at birth, and child mortality rate the study rejected the null hypothesis that favor random effect model (thus fixed effect model employed for analysis), while for gross primary school enrolment rate we fail to reject (so the study used random effect model for interpretations). [See Appendix 7, 8 and 9 for detail]

### **5.2.4 Sargan test**

The Sargan test for over-identifying restrictions is used to determine if the instruments are suitable. The null hypothesis states that "the instruments as a group are exogenous". Consequently, a higher p-value is preferred. Thus, if the p-value is less than 0.05, we reject the null hypothesis in favor of the alternate. The null hypothesis of no autocorrelation is applied to the differenced residuals (Mileva, 2007). [See Appendix 7]

### **5.2.5 Multicollinearity Test**

In the presence of multicollinearity, the regression coefficients possess large standard errors (in relation to the coefficient themselves), which means the coefficients cannot be estimated with great precision or accuracy (Gujarati, 2004: pp. 344). To check for the presence of Multicollinearity in the model we have used the variance covariance matrix presented in the [See Appendix 3]. The table implies that there is no problem of Multicollinearity in the model.

### **5.2.6 Panel cointegration test**

The panel unit root tests confirm that all variables are integrated in order  $I(1)$ , then we test for evidence of a long-run relationship. The Kao's residual cointegration test (Kao (1999)) is used to test the null hypothesis of the nonexistence of cointegration against the alternative of cointegration. The results reported in Table 5.3 provide strong evidence for panel cointegration between the poverty, stock external debt to GNI, external debt to export, GDP per capita, gross domestic fixed capital formation, education, health condition, and inflation and trade openness. The tests of panel cointegration based approaches found that there was no long-run relationship observed between external poverty, stock external debt to GNI, external debt to export, GDP per capita, gross domestic fixed capital formation, education, health condition, and inflation and trade openness. [See appendix 4]

### **5.2.7 Testing for Serial Correlation AR (1)**

Serial Correlation AR (1) tests in a model where the regressors are not strictly exogenous, at least one of the regressors is correlated with one period lagged error term. Since the presence of this serial correlation biases the standard errors and causes the results to be less efficient, we should be concerned about testing for it. To test for autocorrelation, in this study we used the Wooldridge test for autocorrelation designed by Wooldridge (2002) Wooldridge test for autocorrelation found to be 0.001 suggesting that there is a positive autocorrelation in the estimated model. [See Appendix 5 for more details]. Based on all these tests, it is observed that serial autocorrelation and heteroskedasticity prevail.

### **5.2.8 Test for Cross-Sectional Dependence**

Inoue and Solo (2006) LM-test (cross-sectional dependence) test is used to test whether the residuals are correlated across entities with the null hypothesis of not correlated residuals. The test result is presented in the appendix 6. According to Inoue and Solo LM-test test, the study accepted the null hypothesis (it is significant at 5% that says residuals are uncorrelated).

In addition, Diagnostics test for all non-monetary-Human Development Indicator of poverty were made and passed diagnostic tests.

### 5.3 Estimation Result of Fixed Effect and Random Effect Model

#### *i. Growth model: Dependent variable-real GDP growth rate*

As shown in the table below-fixed effect standard errors estimation result, we have seen that out of six explanatory variables five of them are significantly affected the economic growth of SSA countries from 2007 to 2018.

*Table 3: Fixed Effect estimation result-growth nexus debt model*

<i>Variables</i>	<i>Coef.</i>	<i>Std. Err.</i>
<i>A</i>		
gdpc	0.006**	(0.00264)
lnexd_gni	3.293	(2.134)
lns_exp	-0.523**	(0.580)
lnext_exp	-4.599***	(1.513)
edu_prim	0.085	(0.0702)
heath_lexp	-1.224***	(0.374)
child_mortality	-0.233***	(0.0699)
gfcf	0.099*	(0.0521)
trade openness	0.007	(0.0349)
inflation	-0.042***	(0.0634)
constant	88.360***	(28.27)
Observations	424	
Number of c_id	37	
R-squared	0.221	

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

Table 3 shows that both total debt service to export ratio and external debt service to export ratio have a negative and significant effect. Thus, on average, 1 percent increases in growth of total debt service to export ratio and external debt service to export ratio of the countries results in 0.5 and 4.6 percent reduction in economic growth, respectively. This result is consistent with the classical and monetarist theory of public debt. It also agrees with the findings of Greene, 1989; Iyoha, 1999; Presbitero, 2006; Reinhart et al., 2012, and Siddique and Padda, 2017, that external debt depresses investment through both a disincentive effect and a crowding out effect and debt stock reduction would have significantly increased investment and growth performance. The result of negative and significant effect of external public debt service to export ratio is supported by the findings of Elbadawi et al. (1997), Adesola (2009) and Ali and Mustafa (2012).

Similarly, gross fixed capital formation has positive and significant effect on the economic growth and findings were similar with Firebaugh (1992), Borensztein et al. (1998) and Asiedu (2002). The coefficients of non-income determinant-life expectancy at birth and under-five child mortality rate signs have negative and significant related to GDP growth.

## 5.4 Estimation Result of GMM and Fixed Effect Model for poverty Indicators

### *I. Poverty Headcount Ratio*

The key objective is to estimate the effect of external public debt and other independent variables on the poverty reduction of SSA countries. In order to identify the way to treat the individual effect as a fixed or random the researcher developed two types of model namely fixed effect and random effect model. The result obtained from the fixed effect model using Stata is presented in [Appendix 7].

In order to decide between fixed effect and random effect model, it is mandatory to run a Hausman test where the null hypothesis is that the preferred model is random effects and the alternative is the fixed effects. The result of the Hausman test and indicates that the null hypothesis is rejected (the P value is less than 5). This implies that the fixed effect model is the appropriate model for estimating the relationship between external debt with other independent variables and poverty headcount ratio in the selected 40 SSA countries. [See Appendix 7]

The FE result for the basic model of poverty headcount to other independent variables confirm that poverty headcount ratio is negatively related to GDP per capital, gross fixed capital formation trade openness, gross primary school enrolment rate, life expectancy at birth, inflation and a debt indicators of external debt to export ratio. Whereas, the ratio is positively related to absence of violence, under-five child mortality rate and two debt indicator of stock of external debt to GNI and total debt service to export. However, the estimation result shows that only GDP per capital, stock of external debt to GNI, total debt service to export, gross primary school enrollment, under-five child mortality rate, and trade openness are statistically significant variables.

Table 4: GMM and Fixed effect model estimation test results-poverty headcount ratio

Variables	(1)		(2)	
	pov_hc			
	FE		SGMM	
	Coef.	Std. Err.	Coef.	Std. Err.
gdpc	-0.005**	(0.00205)	0.001	-0.00013
exd_gni	0.050*	(0.0284)	0.0422**	(0.0183)
ds_exp	0.038***	(0.0573)	0.063	(0.0671)
ext_exp	-0.0001	(0.00152)	-0.002**	(0.000919)
edu_prim	-0.180***	(0.0512)	-0.042	(0.0580)
heath_lexp	-0.431	(0.312)	0.395*	(0.219)
child_mortality	0.185***	(0.0538)	0.059	(0.0363)
gfcf	-0.032	(0.0406)	-0.105**	(0.0440)
trdop	-0.030*	(0.0222)	-0.033	(0.0260)
no_violence	0.050	(0.0330)	0.163***	(0.0534)
inflation	-0.0003	(0.0492)	-0.168*	(0.0932)
Constant	78.500***	(23.17)	-26.960*	(15.86)
	Observations	424	Observations	424
	No. of c_id	37	No. of c_id	37
	R-squared	0.431		

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

The study found that a 1 percent increase in real GDP per capital will lead to 0.01 percent reduce proportion of individual or households earning less than a given absolute level of real income. The finding were similar to (Roemer and Gugerty (1997), Ravallion and Chen (2003) and Dollar and Kraay 2000) who found proportion poverty can be reduced (or low incomes increased) by increase in average annual growth rate.

The coefficient estimate of debt indicators are statistically significant and positive, indicating that high external indebtedness is positively correlated to poverty headcount ratio. A 1 percent increase in stock of external debt to GNI and total debt service to export will lead to about 0.1 and 0.04 percent increasing proportion of individual or households earning less than a given absolute level of real income, respectively. A number of studies indicate that when debt is not canalized in income-generating and productive activities, the ability of a debtor nation to repay the debt is significantly reduced. Hence, when debts are contracted to cover public debts or fixed charges instead of investment opportunity, these debts cannot allowed added value by reduction unemployment, and improving social conditions. Another explanation is advanced to justify the

positive relation between external debt and poverty. The high level of debt is considered as an impediment to sustainable economic growth and poverty reduction. Our results are in line with the works of Zaghdouid and Hakimi, (2017), (Siddique (1994), Maghyreh and Omet (2002) and Berensmann (2004)) which support the debt overhang and debt crowding out hypothesis.

Similarly, the rate of gross of primary enrollment rate increase by 100 percent, the study shows the proportion of people who living under poverty line will reduce by 5 percent, whereas proportion of people who living under poverty line will increase by about 4 percent when under-five child mortality rate increases by one hundred percent.

Finally, trade openness coefficient were statistically significant and negative, suggesting it reduces the level poverty as it increases. The negative association between trade openness and poverty can be explained also through infrastructure and institutional factors. In a country with a sound maritime and air transport, trade activity is more developed. Also, trade can be influenced by several institution qualities such as legal environment, rule of law, business environment. Countries that fighting corruption, offering a stable and attracting business environment can accelerate trade which reduce poverty and enhance economic growth.

However, the system GMM results, where gross primary enrollment rate, life expectance at birth and under-five child mortality rate are treated endogenous, shown a different picture. The coefficient of real GDP per capital turns to positive but statistically insignificant. On the other hand, coefficients of debt indicators of stock of debt ration to GNI are significant and positive while the coefficient of external debt to export negative and significant, thus, popped up with mixed result; suggesting that along with income and non-income poverty indicators indebtedness of external debt to GNI could also directly affect the ratio of people living under poverty line notably through its disincentive and debt overhung on the investment and saving. The study found that 22 percent increase in the level of stock of external debt leads to one percent increase in proportion of people leaving under poverty line. On other side the study found the coefficient total external debt service to export is significant and negative; suggesting that increase in external debt service to export ratio the proportion people who living under poverty line would decrease. Figure of coefficient shows that the power of impact very low though the coefficient is significant. *Ceteris paribus*, on average 2.5 percent increase in life expectance at birth result one

percent decrease in proportion of people leaving under poverty line. The other results from GMM are similar with fixed effect model estimation result.

## II. Life expectancy at birth

Table 5: GMM and Fixed effect model estimation test results-life expectancy at birth

Variables	(1)		(2)	
	heath_lexp		SGMM	
	FE	Robust		
	Coef.	Std. Err.	Coef.	Std. Err.
L.heath_lexp			0.895***	(0.0240)
gdpc	0.006***	(0.000486)	0.001***	(3.47e-05)
exd_gni	-0.066***	(0.00816)	0.007	(0.00488)
ds_exp	0.057	(0.0355)	-0.031***	(0.0115)
ext_exp	-0.001*	(0.000382)	-0.0003	(0.000412)
gfcf	-0.010	(0.0248)	0.019*	(0.00987)
trdop	-0.030*	(0.0152)	-0.012**	(0.00500)
no_violence	-0.020	(0.0173)	0.008*	(0.00457)
inflation	-0.040**	(0.0154)	0.004	(0.00509)
Constant	51.430***	(1.951)	6.918***	(1.607)
	Observations	424	Observations	424
	No. of c_id	38	No. of c_id	37
	R-squared	0.123		

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

The fixed effect estimation result presented in the table 5 above for the basic model of life expectancy at birth to macroeconomic variables confirm that five variable are statistically significant. Life expectancy is positively related to real GDP per capital and two external debt indicators of stock of external debt to GNI and external debt to export, and negatively to trade openness and inflation. The study found that a two percent increase in real GDP per capital will leads to about one percent increase in life expectancy. This result is different from one studied by Loko et al. (2003) who found that a 5 percent increase in real GDP per capital will lead to 1 percent increase in life expectancy at birth for selected lower income countries, and also Ichida and moses (2001) who found 10 percent increase will increase life expectancy at birth by 1 percent.

Out of three estimated coefficient on the debt indicators two are statistically significant and negative, suggesting that higher external indebtedness is negatively related to life expectancy at birth. One percent increase in stock of external debt to GNI will leads to six percent reduction on the level of life expectancy at birth, and external debt to export and life expectancy at birth has one to one percent negative association in study of SSA countries under consideration. This result of negative effect on health are consistent with (Lyons and Yilmazer, 2005; Keese and Schmitz, 2010; Lau and Leung, 2011). Inflation and life expectancy at birth have negative relationship. As inflation increases by one percent the life expectancy at birth of people will deteriorate by about four percent.

The two step system GMM results, where debt indicators and the variable of absence of violence in the country are treated endogenously and include lag value of dependent variable, show a different picture to the result from fixed effect. The estimated coefficient of real GDP per capital remain positive and statistically significant, but only the estimated coefficient of total debt service to export from debt indicators appears significant, suggesting that, along with its impact through income higher indebtedness could also affect directly life expectancy notably through its liquidity effect on the budget. The study found that a 27 percent increase in the total debt service to export ratio will leads to a 1 percent reduce in life expectancy at birth. The estimated coefficient on the other two debt indicators of total stock of external debt to GNI ratio and external debt service to export are not statistically significant.

The estimated coefficient of political stability and absence of violence/terrorism (no-violence) appears significant and positive. This institutional variable reflects the quality of governance by ranking percentile among all countries ranging (0) lowest to highest (100). Life expectancy at birth and absence of terrorism or violence are positively related, suggesting that as percentile rank of absence of violence of a country increases to wards to highest (100) life expectancy at birth of population increase as well. Other variable of gross domestic investment formation is associated positively and significantly with the dependent variable. Findings show that an increase of 5 percent in real gross fixed capital formation increases life expectancy at birth of people by 0.2 percent.

### III. Under-five child mortality rate

Table 6: GMM and Fixed effect model estimation test results-child mortality rate

Variables	(1)		(2)	
	child_mortality			
	FE		SGMM	
	Coef.	Robust Std. Err.	Coef.	Std. Err.
gdpc	-0.013***	(0.0024)	-0.005***	(0.000355)
exd_gni	-0.270***	(0.0479)	-0.230***	(0.0316)
ds_exp	-0.441***	(0.0985)	-0.774***	(0.0956)
ext_exp	-0.001	(0.00311)	-0.014***	(0.00109)
gfcf	0.012	(0.0813)	-0.289***	(0.0921)
trdop	0.114***	(0.0405)	0.100***	(0.0295)
no_violence	-0.021	(0.0641)	-0.442***	(0.0513)
inflation	0.146*	(0.0826)	0.343***	(0.0893)
Constant	106.100***	(6.928)	114.700***	(2.166)
	Observations	462	Observations	462
	No. of c_id	38	No. of c_id	38
	R-squared	0.436		

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Regarding to the under-five child mortality rate the fixed effect result which presented in the table 6 above of the basic model shows that five variables are statistically significant, indicated mortality rate is negatively correlated with real GDP per capital, stock of external debt to GNI and debt service to export, and positively related to trade openness and inflation. The estimated coefficient of real GDP per capital to child mortality is negative and significant, suggesting as per capital income of people is increases the rate of child mortality reduce. GDP per capital has been shown to be associated with high under-5 mortality in a previous study by Loko et al. (2003) and Moser and Ichida (2001). However, this study found that 10 percent increase in real GDP per capital will leads to reduce 0.2 percent in child mortality rate that is significant but low. According to Dhrifi, Abdelhafidh, 2019, a high and sustainable growth rate would be expected to solve problems of food insecurity, the dilapidated nature of buildings and equipment, the lack of adequate social infrastructure and the budget deficit to reduce child and maternal mortality

From fixed effect result one can we see that the coefficient of stock of external debt to GNI and debt service to export are statistically significant and negative, indicating an increase in debt

would leads to decline in under-five child mortality rate. This finding is different from Loko et al. (2003) who studied the relationship between debt and infant mortality rate and found that decline in debt reduces the rate of infant mortality (under one year). Possible explanation for this is that infant child mortality rate can be diminished everywhere in the region with relation small amount of expenditure. According to Hojman, David E., the role played by public expenditure in health vaccination coverage, access to water, or malnutrition can be assessed as well as the played by structural adjustment variables such as external debt GNP ratio. They concluded infant and child mortality was lower in countries with high external debt. Thus, there is some sort of debt could benefit in reducing of rate death of child.

From table above other result we notices that increase in inflation rate has a significant detrimental effect on nourishment and consequently lead to higher levels of child mortality in SSA countries. High inflation rates are also found to cause an increase in undernourishment only in LDCs and thus leading to an increase in infant and child mortality in these poorest countries. This result is consistent with the Lee, Hyun-Hoon, et al (2016) observation that, in lower-income countries, food has a higher share in household expenditures and LDCs are likely to be net food importing countries.

However, trade openness is positively and significant related to child mortality rate, suggesting that significant increase in child mortality after trade liberalization. As nine percent open of trade to the world or liberalized under-five child mortality would increase by about a percent. This effect of external debt to mortality is consistent with Owen and Wu (2007) found child mortality increase more when trade liberalization happened in democracies, in middle income countries.

The system GMM result shows that after correcting simultaneously for endogenous and omitted variables it turns out that all coefficient of variable of interest negative and significant expect trade liberalization and inflation. The results from GMM are also similar with fixed effect model estimation result except gross fixed capital formation to GDP ratio.

#### ***IV. Gross primary school enrolment***

The result from Breusch and Pagan Lagrangian multiplier test for random effects shows that the null hypothesis is that the preferred model is random effects and the alternative is the fixed effects. The result indicates p values=0.26 that we cannot reject the null that the model is random.

For random effect model result of the model shows that only stock of external debt to GNI variable is statistically significant. It is negatively correlated with gross primary school enrolment rate, suggesting that as debt level increases primary school enrolment of students decrease. About 10 percent increase in stock external debt to GNI will leads to one percent reduce in gross primary school enrolment.

## **CHAPTER SIX**

### **SUMMARY, CONCLUSIONS, RECOMMENDATIONS and FURTHER STUDIES**

#### **6.1. Summary and Conclusions**

The literature shows that the level of external debt has an impact on economic growth, which, in turn is found in the many studies to be a key determinant of poverty. External debt is likely to affect poverty through its impact on economic growth, however, the explicit link among indebtedness, growth, and poverty has generally been lacking in the empirical literature. The main aim of the study was to find whether external debt affects the level of poverty by using panel data for 40 sub-Saharan Africa Countries.

To investigate the impact of external debt on poverty, the study demonstrated by measuring proportion of people living under poverty line as well as on non-monetary explanatory variables (Life Expectance at Birth Child, Child Mortality Rate and Gross Primary School Enrolment Rate) on variables interest. Fixed-effect model as well as the Arellano and Bover (1995) and Blundell and Bond (1998) system GMM are employed to explore the linkage.

The empirical result from panel data models indicates that there exists a negative impact of external debt on income (GDP per capital), and non-monetary measurement of poverty headcount ratio, life expectancy at birth and gross primary school enrolment rate. However, under-five child mortality was lower in SSA countries with high external debt. Other important findings from the use of fixed as well as system GMM estimation result; life expectancy at birth would increase as real GDP per capital, capita formation and percentile rank of absence of violence in a country increases but decrease with inflation rise. On the contrary, as per capital income of GDP people, capita formation and percentile rank of absence of violence in a country increases the rate of child mortality reduces but it would increase as inflation increases. Finally, the negative association between trade openness and poverty on other findings can be explained by a sound maritime and air transport, trade activity would lead to more development.

The estimation result of a panel fixed effect model and system GMM model indicates the presence of causality between external debt and poverty. This result shows that a higher external debt increases poverty. Thus, a high debt service impacts negatively the social spending by reducing government resources allocated to poor such as education and health.

The main conclusion is that external debt indicators have a direct impact on poverty (which is measured by SHDI and Poverty Headcount Ratio). The study also concluded after the effect of income and other variables of interest on the level of poverty has been taken into account; external indebtedness has a limited but significant impact on poverty reduction. The finding of a negative relationship between external debt and poverty indicators does not necessarily imply that SSA countries should cut back on foreign borrowing in order to boost growth.

## **6.2 Recommendation and Further Studies**

In order to reduce poverty, the key policy is to focus on the factor that affects or impedes economic growth. External indebtedness is one of them. Focusing exclusively on external debt is probably not a very effective way to reduce poverty. In this manner, a country mainly focusing on reducing poverty, which still needs to be supported by additional financing from creditor countries and also debt relief. Thus, if countries effectively utilize these resources could maximize the benefits of poor people.

In SSA countries, government should redefine its priorities while contracting new borrowing agreements with the donors. The new priorities must be set to targets on poverty as well as GDP growth. It is problematic to accept increased burden of debt that at the same time also increases poverty in the country even if it is in the progress of GDP growth rates. In countries like SSA, saving potential is low; therefore, creditor countries should write off the debt of the developing countries on humanitarian or political basis as they are facing debt crisis. If the creditor countries cannot write off the debt of the developing countries, they should do debt rescheduling for these countries, i.e. should change the terms of existing loans, by extending repayment dates without increase in nominal interest rates. If the above solution is not agreeable, then another temporary measure to solve the debt problem is to increase the period of repayment and reduce the interest rates on the borrowing countries still struggling for existence.

On the top though appropriate debt management mechanisms should be adopted and implemented to keep debt levels within sustainable limits. Specifically, the government should invest the borrowed money on productive investments, reduces unnecessary expenditures, and try to reduce corruption.

To the end of external debt and poverty relationship conclusion, an exhaustive array of tests and plenty of further research will be required. The explicit link among indebtedness, growth, and poverty has generally been lacking in the empirical literature and there is also still ongoing debate on the extent to which growth actually affect poverty. Thus far, no one has been delivered indisputable evidence of the link between external debt and economic growth and poverty. This will requires in-depth studies of transmission channels linking the external debt and poverty. In addition, the nexus between aforementioned variables will require further research by considering institutional quality and management.

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## APPENDIX

### *Annex 1: Summarized- Summary Statistics*

```
. global xlist gdp exd_gni ds_exp ext_exp edu_prim heath_lexp child_mortality gfcf trdrop no_violence inflation
. global ylist pov_hc
. xtsum $ylist $xlist
```

Variable		Mean	Std. Dev.	Min	Max	Observations
pov_hc	overall	40.83053	20.48312	2.544	90.786	N = 480
	between		19.99016	4.85675	79.63517	n = 40
	within		5.397108	22.46512	62.82137	T = 12
gdp	overall	2062.298	2313.877	273.49	9521.29	N = 480
	between		2330.37	368.1158	9179.063	n = 40
	within		219.3553	924.087	2927.567	T = 12
exd_gni	overall	35.90523	28.21566	4.17	309.97	N = 480
	between		19.52791	7.043333	78.97583	n = 40
	within		20.58012	-17.70394	273.0761	T = 12
ds_exp	overall	6.960535	5.888971	.5	34.9	N = 299
	between		4.408688	1.8625	18.15	n = 38
	within		3.926746	-5.389465	30.62304	T = 7.86842
ext_exp	overall	354.0207	584.1277	8.22	5385.14	N = 480
	between		481.9586	28.615	2311.565	n = 40
	within		338.0168	-448.5143	4603.978	T = 12
edu_prim	overall	102.7997	21.40034	43.31	149.31	N = 374
	between		20.03402	51.05583	144.0418	n = 40
	within		5.300511	85.80635	118.9822	T-bar = 9.35
heath_~p	overall	59.55083	5.621332	40.7	72.78	N = 480
	between		4.90867	48.11833	71.625	n = 40
	within		2.838602	48.35083	69.65083	T = 12
child_~y	overall	82.71146	30.4849	15.8	183.2	N = 480
	between		28.14217	22.60833	146.475	n = 40
	within		12.47137	49.73646	123.4531	T = 12
gfcf	overall	23.42987	8.298627	3.29	54.3	N = 480
	between		6.894191	9.573333	36.64417	n = 40
	within		4.735909	1.246541	50.47154	T = 12
trdrop	overall	70.66058	29.41921	20.72	311.35	N = 480
	between		26.24863	35.05667	143.0625	n = 40
	within		13.86802	35.51975	239.5206	T = 12
no_vio~e	overall	31.37365	19.91929	.95	88.63	N = 480
	between		18.74263	2.819167	85.23833	n = 40
	within		7.318403	2.369478	63.08448	T = 12
inflat~n	overall	7.117128	7.202547	-8.97	63.29	N = 470
	between		5.255082	1.615	25.89	n = 40
	within		4.969607	-7.512872	44.51713	T-bar = 11.75

### *Annex 2: Heteroskedasticity test*

```
. xttest3
```

Modified Wald test for groupwise heteroskedasticity  
in fixed effect regression model

H0:  $\sigma(i)^2 = \sigma^2$  for all i

```
chi2 (40) = 13461.88
Prob>chi2 = 0.0000
```

### Annex 3: Multicollinearity

```
. corr $ylist $xlist
(obs=220)
```

	pov_hc	gdpc	exd_gni	ds_exp	ext_exp	edu_prim	heath_~p	child_~y	gfcf	trdop	no_vio~e
pov_hc	1.0000										
gdpc	-0.2992	1.0000									
exd_gni	-0.2735	-0.0366	1.0000								
ds_exp	-0.2612	-0.0206	0.4415	1.0000							
ext_exp	-0.3169	0.0756	0.6144	0.1300	1.0000						
edu_prim	0.3961	-0.0540	-0.0252	-0.0944	-0.0316	1.0000					
heath_lexp	-0.1959	0.2687	0.3412	0.1453	0.5957	0.0646	1.0000				
child_mort~y	0.2849	-0.2696	-0.3797	-0.2768	-0.5231	-0.1977	-0.7697	1.0000			
gfcf	-0.0938	0.1838	0.2268	0.0361	0.1617	-0.0837	0.2376	-0.1081	1.0000		
trdop	-0.1744	0.0425	0.3753	-0.1527	0.1286	0.1186	-0.1162	0.0076	0.2460	1.0000	
no_violence	-0.1756	0.2317	0.2359	-0.0321	0.3403	0.3810	0.2694	-0.4701	0.1675	0.3772	1.0000
inflation	0.0430	-0.1043	0.0287	-0.0289	-0.0460	-0.0281	-0.0096	-0.0313	-0.1712	-0.0353	-0.1607
	inflat~n										
inflation	1.0000										

### Annex 4: Cointegration test

```
. xtointttest kao pov_hc gdpc exd_gni ext_exp heath_lexp child_mortality gfcf trdop no_violence inflation, lags(2)
```

Kao test for cointegration

```
Ho: No cointegration          Number of panels      =    40
Ha: All panels are cointegrated Avg. number of periods =    9.75

Cointegrating vector: Same
Panel means:           Included      Kernel:                Bartlett
Time trend:           Not included   Lags:                 1.35 (Newey-West)
AR parameter:         Same           Augmented lags:       2
```

	Statistic	p-value
Modified Dickey-Fuller t	0.8528	0.1969
Dickey-Fuller t	-0.0920	0.4633
Augmented Dickey-Fuller t	-2.4709	0.0067
Unadjusted modified Dickey-Fuller t	0.9546	0.1699
Unadjusted Dickey-Fuller t	-0.0094	0.4963

### Annex 5: Serial Correlation test

```
. global xlist gdpc exd_gni ext_exp heath_lexp child_mortality gfcf trdop no_violence inflation
```

```
. global ylist pov_hc
```

```
. xtserial $ylist $xlist
```

Wooldridge test for autocorrelation in panel data

```
H0: no first-order autocorrelation
F( 1, 39) = 20.221
Prob > F = 0.0001
```

## Appendix 6: Cross-Sectional Dependence test

```
. xttest, lags(2)
(260 missing values generated)
```

```
Inoue and Solo (2006) LM-test as postestimation
Panelvar: c_id
Timevar: year
p (lags): 2
```

Variable	IS-stat	p-value	N	maxT	balance?
Post Estimation	21.96	0.056	37	8	gaps

Notes: Under  $H_0$ ,  $LM \sim \chi^2(p \cdot T - p(p+1)/2)$   
 $H_0$ : No auto-correlation of any order.  
 $H_a$ : Auto-correlation up to order 2.

## Appendix 7: Panel Regression Result

### \*Main Model-pov\_hc\*

```
. xtreg $ylist $xlist, fe
```

```
Fixed-effects (within) regression
Group variable: c_id
```

```
Number of obs = 220
Number of groups = 37
```

```
R-sq:
```

```
within = 0.4308
between = 0.0622
overall = 0.0518
```

```
Obs per group:
```

```
min = 1
avg = 5.9
max = 8
```

```
corr(u_i, Xb) = -0.4050
```

```
F(11,172) = 11.83
Prob > F = 0.0000
```

pov_hc	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
gdp	-.0047588	.0020531	-2.32	0.022	-.0088112	-.0007063
exd_gni	.0493193	.0283836	1.74	0.084	-.0067056	.1053442
ds_exp	.0383752	.057259	0.67	0.504	-.0746456	.1513961
ext_exp	-.000276	.0015246	-0.18	0.857	-.0032853	.0027333
edu_prim	-.18006	.051204	-3.52	0.001	-.2811292	-.0789909
heath_lexp	-.4314247	.3117653	-1.38	0.168	-1.046803	.1839539
child_mortality	.1848005	.0537933	3.44	0.001	.0786204	.2909805
gfcf	-.0319528	.0405841	-0.79	0.432	-.1120598	.0481542
trdop	-.0293379	.0221948	-1.32	0.188	-.0731471	.0144713
no_violence	.0497301	.0329857	1.51	0.133	-.0153787	.1148389
inflation	-.0002395	.049202	-0.00	0.996	-.097357	.0968779
_cons	78.49928	23.17437	3.39	0.001	32.7565	124.2421
sigma_u	22.070722					
sigma_e	2.4577856					
rho	.98775095	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(36, 172) = 230.07
```

```
Prob > F = 0.0000
```

Random-effects GLS regression  
 Group variable: c\_id

Number of obs = 220  
 Number of groups = 37

R-sq:

within = 0.4238  
 between = 0.0615  
 overall = 0.0491

Obs per group:

min = 1  
 avg = 5.9  
 max = 8

corr(u\_i, X) = 0 (assumed)

Wald chi2(11) = 118.37  
 Prob > chi2 = 0.0000

	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
pov_hc						
gdpc	-.0025929	.0011043	-2.35	0.019	-.0047573	-.0004285
exd_gni	.0509456	.0285676	1.78	0.075	-.0050458	.1069371
ds_exp	.0270701	.0589205	0.46	0.646	-.088412	.1425523
ext_exp	-.0005732	.0015383	-0.37	0.709	-.0035882	.0024417
edu_prim	-.1357295	.0504648	-2.69	0.007	-.2346388	-.0368202
heath_lexp	-.389514	.2926731	-1.33	0.183	-.9631427	.1841146
child_mortality	.1981215	.0531265	3.73	0.000	.0939955	.3022475
gfcf	-.0283713	.0418103	-0.68	0.497	-.1103181	.0535755
trdop	-.0294623	.022602	-1.30	0.192	-.0737614	.0148368
no_violence	.0505569	.0333629	1.52	0.130	-.0148332	.1159469
inflation	.0102147	.05008	0.20	0.838	-.0879403	.1083697
_cons	66.38389	22.83258	2.91	0.004	21.63287	111.1349
sigma_u	17.525477					
sigma_e	2.4577856					
rho	.98071189	(fraction of variance due to u_i)				

. hausman fe re

	Coefficients			
	(b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
gdpc	-.0047588	-.0025929	-.0021659	.0017308
exd_gni	.0493193	.0509456	-.0016263	.
ds_exp	.0383752	.0270701	.0113051	.
ext_exp	-.000276	-.0005732	.0002972	.
edu_prim	-.18006	-.1357295	-.0443305	.0086688
heath_lexp	-.4314247	-.389514	-.0419106	.1074247
child_mort~y	.1848005	.1981215	-.013321	.0084439
gfcf	-.0319528	-.0283713	-.0035815	.
trdop	-.0293379	-.0294623	.0001244	.
no_violence	.0497301	.0505569	-.0008268	.
inflation	-.0002395	.0102147	-.0104542	.

b = consistent under Ho and Ha; obtained from xtreg  
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(11) = (b-B)'[(V\_b-V\_B)^(-1)](b-B)  
 = 35.38  
 Prob>chi2 = 0.0002  
 (V\_b-V\_B is not positive definite)

# GMM

```
. xtabond2 pov_hc l.pov_hc $xlist, gmm(l2.(pov_hc edu_prim heath_lexp child_mortality ), collapse) iv( gdpc
> ext_exp gfcf ) level
Favoring speed over space. To switch, type or click on mata: mata_set matafavor space, perm.
Warning: Number of instruments may be large relative to number of observations.
```

Dynamic panel-data estimation, one-step system GMM

```
Group variable: c_id          Number of obs   =    220
Time variable : year        Number of groups =    37
Number of instruments = 46    Obs per group: min =    1
Wald chi2(12) = 87709.98      avg           =   5.95
Prob > chi2    = 0.000        max           =    8
```

	pov_hc	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
	pov_hc						
	L1.	1.040015	.0438913	23.70	0.000	.95399	1.126041
	gdpc	-.0000723	.0001266	-0.57	0.568	-.0003204	.0001758
	exd_gni	.042176	.0183289	2.30	0.021	.006252	.0781
	ds_exp	.0627157	.0670913	0.93	0.350	-.0687809	.1942123
	ext_exp	-.0021821	.000919	-2.37	0.018	-.0039834	-.0003809
	edu_prim	-.0423256	.0580177	-0.73	0.466	-.1560383	.0713871
	heath_lexp	.3945688	.2185936	1.81	0.071	-.0338668	.8230044
	child_mortality	.0584792	.0363232	1.61	0.107	-.012713	.1296714
	gfcf	-.1051731	.0439898	-2.39	0.017	-.1913915	-.0189546
	trdrop	-.0324956	.0260409	-1.25	0.212	-.0835348	.0185436
	no_violence	.162934	.0534357	3.05	0.002	.0582019	.2676661
	inflation	-.1681343	.0932268	-1.80	0.071	-.3508554	.0145869
	_cons	-26.95998	15.86414	-1.70	0.089	-58.05311	4.133157

Instruments for first differences equation

Standard

D.(gdpc exd\_gni ds\_exp ext\_exp gfcf)

GMM-type (missing=0, separate instruments for each period unless collapsed)

L(1/11).(L2.pov\_hc L2.edu\_prim L2.heath\_lexp L2.child\_mortality) collapsed

Instruments for levels equation

Standard

gdpc exd\_gni ds\_exp ext\_exp gfcf

\_cons

GMM-type (missing=0, separate instruments for each period unless collapsed)

D.(L2.pov\_hc L2.edu\_prim L2.heath\_lexp L2.child\_mortality) collapsed

Arellano-Bond test for AR(1) in first differences: z = -2.12 Pr > z = 0.034

Arellano-Bond test for AR(2) in first differences: z = -1.15 Pr > z = 0.251

Sargan test of overid. restrictions: chi2(33) = 52.76 Prob > chi2 = 0.016  
(Not robust, but not weakened by many instruments.)

Difference-in-Sargan tests of exogeneity of instrument subsets:

GMM instruments for levels

Sargan test excluding group: chi2(29) = 13.71 Prob > chi2 = 0.993

Difference (null H = exogenous): chi2(4) = 39.06 Prob > chi2 = 0.000

iv(gdpc exd\_gni ds\_exp ext\_exp gfcf)

Sargan test excluding group: chi2(28) = 30.06 Prob > chi2 = 0.360

Difference (null H = exogenous): chi2(5) = 22.70 Prob > chi2 = 0.000

## Appendix 8: model specifications test and result

### \*Growth- debt model\*

```
. global xlist gdp lnext_gni lnds_exp lnext_exp edu_prim heath_lexp child_mortality gfcf trdop inflation
```

```
. global ylist a
```

```
. xtreg $ylist $xlist, re
```

```
Random-effects GLS regression           Number of obs   =       220
Group variable: c_id                   Number of groups =        37
```

```
R-sq:                                   Obs per group:
  within = 0.1050                        min =          1
  between = 0.1447                       avg =         5.9
  overall = 0.1091                       max =          8
```

```
corr(u_i, X) = 0 (assumed)              Wald chi2(10)   =       21.95
                                          Prob > chi2     =       0.0154
```

a	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
gdp	-.0004879	.0001759	-2.77	0.006	-.0008325	-.0001432
lnexd_gni	.2988706	1.063701	0.28	0.779	-1.785946	2.383687
lnds_exp	-.6492699	.4510711	-1.44	0.150	-1.533353	.2348132
lnext_exp	-1.262717	.5562164	-2.27	0.023	-2.352881	-.1725531
edu_prim	.0014746	.018371	0.08	0.936	-.0345319	.0374811
heath_lexp	-.0487156	.1166444	-0.42	0.676	-.2773344	.1799033
child_mortality	-.0273126	.0201362	-1.36	0.175	-.0667789	.0121537
gfcf	.0957202	.0389512	2.46	0.014	.0193773	.1720631
trdop	-.0182403	.016545	-1.10	0.270	-.0506678	.0141872
inflation	-.0109765	.0417336	-0.26	0.793	-.0927728	.0708199
_cons	16.24535	8.598631	1.89	0.059	-.6076588	33.09836
sigma_u	1.2995832					
sigma_e	3.1973619					
rho	.14178231	(fraction of variance due to u_i)				

```
. xtreg $ylist $xlist, fe
```

```
Fixed-effects (within) regression       Number of obs   =       220
Group variable: c_id                   Number of groups =        37
```

```
R-sq:                                   Obs per group:
  within = 0.2205                        min =          1
  between = 0.0143                       avg =         5.9
  overall = 0.0081                       max =          8
```

```
corr(u_i, Xb) = -0.9880                 F(10,173)      =        4.89
                                          Prob > F       =       0.0000
```

a	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
gdp	.0061226	.0026402	2.32	0.022	.0009114	.0113337
lnexd_gni	3.292616	2.133578	1.54	0.125	-.9185785	7.50381
lnds_exp	-.5230956	.5800222	-0.90	0.368	-1.667927	.6217356
lnext_exp	-4.598757	1.51308	-3.04	0.003	-7.585232	-1.612283
edu_prim	.0854978	.070159	1.22	0.225	-.0529801	.2239757
heath_lexp	-1.223785	.373711	-3.27	0.001	-1.961405	-.4861645
child_mortality	-.232554	.0698779	-3.33	0.001	-.3704771	-.094631
gfcf	.0990656	.0520685	1.90	0.059	-.0037058	.201837
trdop	.006773	.0349343	0.19	0.846	-.0621794	.0757254
inflation	-.0414421	.0633595	-0.65	0.514	-.1664992	.0836151
_cons	88.35838	28.27083	3.13	0.002	32.55822	144.1585
sigma_u	17.886774					
sigma_e	3.1973619					
rho	.96903584	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(36, 173) = 2.32
```

```
Prob > F = 0.0002
```



. xtreg \$ylist \$xlist, re

```

Random-effects GLS regression              Number of obs   =       292
Group variable: c_id                      Number of groups =        38

R-sq:                                     Obs per group:
    within = 0.5281                        min =           3
    between = 0.1672                       avg =          7.7
    overall = 0.1870                       max =           8

corr(u_i, X) = 0 (assumed)                 Wald chi2(8)    =       249.26
                                              Prob > chi2     =        0.0000

```

heath_lexp	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
gdpc	.0017739	.0002417	7.34	0.000	.0013002	.0022476
exd_gni	.0670364	.0096869	6.92	0.000	.0480505	.0860223
ds_exp	.0486477	.0203531	2.39	0.017	.0087564	.088539
ext_exp	.0002305	.0006079	0.38	0.705	-.000961	.0014221
gfcf	.0020665	.0166974	0.12	0.902	-.0306598	.0347928
trdop	-.0401209	.0080656	-4.97	0.000	-.0559291	-.0243126
no_violence	-.0227004	.012486	-1.82	0.069	-.0471725	.0017716
inflation	-.0634883	.0165465	-3.84	0.000	-.0959188	-.0310579
_cons	58.68352	1.157492	50.70	0.000	56.41488	60.95216
sigma_u	3.5216817					
sigma_e	1.0167628					
rho	.92305725	(fraction of variance due to u_i)				

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	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) fe	(B) re		
gdpc	-.0047588	-.0025929	-.0021659	.0017308
exd_gni	.0493193	.0509456	-.0016263	.
ds_exp	.0383752	.0270701	.0113051	.
ext_exp	-.000276	-.0005732	.0002972	.
edu_prim	-.18006	-.1357295	-.0443305	.0086688
heath_lexp	-.4314247	-.389514	-.0419106	.1074247
child_mort~y	.1848005	.1981215	-.013321	.0084439
gfcf	-.0319528	-.0283713	-.0035815	.
trdop	-.0293379	-.0294623	.0001244	.
no_violence	.0497301	.0505569	-.0008268	.
inflation	-.0002395	.0102147	-.0104542	.

b = consistent under Ho and Ha; obtained from xtreg  
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

```

chi2(11) = (b-B)'[(V_b-V_B)^(-1)](b-B)
          =          35.38
Prob>chi2 =          0.0002
(V_b-V_B is not positive definite)

```

. xtabond2 heath\_lexp l.heath\_lexp \$xlist, gmm( l.heath\_lexp no\_violence inflation gdpc , lag(2 2)) iv(\$xlist ) robust Favoring speed over space. To switch, type or click on [mata: mata\\_set matafavor space, perm](#).

Dynamic panel-data estimation, one-step system GMM

Group variable: c_id	Number of obs	=	292
Time variable : year	Number of groups	=	38
Number of instruments = 61	Obs per group: min	=	3
Wald chi2(9) = 1.21e+06	avg	=	7.68
Prob > chi2 = 0.000	max	=	8

heath_lexp	Coef.	Robust Std. Err.	z	P> z	[95% Conf. Interval]	
heath_lexp						
L1.	.8952042	.0240466	37.23	0.000	.8480738	.9423346
gdpc	.000111	.0000347	3.20	0.001	.000043	.000179
exd_gni	.0072873	.0048778	1.49	0.135	-.002273	.0168476
ds_exp	-.0310925	.0115318	-2.70	0.007	-.0536944	-.0084906
ext_exp	-.0003385	.0004122	-0.82	0.411	-.0011465	.0004694
gfcf	.0186335	.0098667	1.89	0.059	-.0007048	.0379718
trdop	-.0117246	.0050047	-2.34	0.019	-.0215337	-.0019155
no_violence	.0078581	.004573	1.72	0.086	-.0011047	.0168209
inflation	.0037458	.0050908	0.74	0.462	-.0062321	.0137236
_cons	6.917645	1.606741	4.31	0.000	3.768491	10.0668

Instruments for first differences equation  
 GMM-type (missing=0, separate instruments for each period unless collapsed)  
 L2.(L.heath\_lexp no\_violence inflation gdpc)  
 Instruments for levels equation  
 Standard  
 \_cons  
 GMM-type (missing=0, separate instruments for each period unless collapsed)  
 DL.(L.heath\_lexp no\_violence inflation gdpc)

Arellano-Bond test for AR(1) in first differences: z = -0.66 Pr > z = 0.509  
 Arellano-Bond test for AR(2) in first differences: z = 0.94 Pr > z = 0.345

Sargan test of overid. restrictions: chi2(51) = 707.21 Prob > chi2 = 0.000  
 (Not robust, but not weakened by many instruments.)  
 Hansen test of overid. restrictions: chi2(51) = 31.15 Prob > chi2 = 0.987  
 (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:  
 GMM instruments for levels  
 Hansen test excluding group: chi2(19) = 17.93 Prob > chi2 = 0.527  
 Difference (null H = exogenous): chi2(32) = 13.21 Prob > chi2 = 0.999

## Appendix: 10 \*Under-five Child Mortality\*

```
. global xlist gdp exd_gni ds_exp ext_exp gfcf trdrop no_violence inflation
. xtreg child_mortality $xlist, fe

Fixed-effects (within) regression                               Number of obs   =       292
Group variable: c_id                                         Number of groups =        38

R-sq:                                                         Obs per group:
  within = 0.4355                                           min =           3
  between = 0.1168                                          avg =           7.7
  overall = 0.1153                                          max =           8

corr(u_i, Xb) = -0.6499                                       F(8,246)        =       23.72
                                                           Prob > F        =       0.0000
```

child_mort~y	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
gdp	-.0129704	.0024048	-5.39	0.000	-.0177071	-.0082337
exd_gni	-.2699758	.0478689	-5.64	0.000	-.3642609	-.1756906
ds_exp	-.4405122	.0985464	-4.47	0.000	-.6346146	-.2464098
ext_exp	-.0004977	.003108	-0.16	0.873	-.0066193	.0056239
gfcf	.0115948	.0813453	0.14	0.887	-.1486272	.1718169
trdrop	.114082	.040476	2.82	0.005	.0343583	.1938056
no_violence	-.0209908	.0641115	-0.33	0.744	-.1472682	.1052867
inflation	.1464786	.0825893	1.77	0.077	-.0161939	.309151
_cons	106.123	6.927619	15.32	0.000	92.478	119.768
sigma_u	33.122821					
sigma_e	5.5995549					
rho	.97221473	(fraction of variance due to u_i)				

F test that all u\_i=0: F(37, 246) = 92.84 Prob > F = 0.0000

```
. xtreg child_mortality $xlist, re

Random-effects GLS regression                               Number of obs   =       292
Group variable: c_id                                         Number of groups =        38

R-sq:                                                         Obs per group:
  within = 0.4119                                           min =           3
  between = 0.2180                                          avg =           7.7
  overall = 0.2237                                          max =           8

corr(u_i, X) = 0 (assumed)                                   Wald chi2(8)    =       179.57
                                                           Prob > chi2     =       0.0000
```

child_mort~y	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
gdp	-.0057051	.0012663	-4.51	0.000	-.008187	-.0032233
exd_gni	-.2859701	.0480432	-5.95	0.000	-.380133	-.1918071
ds_exp	-.4290546	.1006745	-4.26	0.000	-.6263731	-.2317361
ext_exp	-.0028387	.0030295	-0.94	0.349	-.0087764	.0030999
gfcf	-.0005223	.082667	-0.01	0.995	-.1625467	.1615021
trdrop	.133323	.0400378	3.33	0.001	.0548504	.2117955
no_violence	-.0535746	.0622193	-0.86	0.389	-.1755221	.068373
inflation	.2039832	.0819907	2.49	0.013	.0432845	.364682
_cons	92.17128	5.985175	15.40	0.000	80.44055	103.902
sigma_u	21.009811					
sigma_e	5.5995549					
rho	.93367768	(fraction of variance due to u_i)				

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	Coefficients			
	(b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
gdp	-.0047588	-.0025929	-.0021659	.0017308
exd_gni	.0493193	.0509456	-.0016263	.
ds_exp	.0383752	.0270701	.0113051	.
ext_exp	-.000276	-.0005732	.0002972	.
edu_prim	-.18006	-.1357295	-.0443305	.0086688
heath_lexp	-.4314247	-.389514	-.0419106	.1074247
child_mort~y	.1848005	.1981215	-.013321	.0084439
gfcf	-.0319528	-.0283713	-.0035815	.
trdrop	-.0293379	-.0294623	.0001244	.
no_violence	.0497301	.0505569	-.0008268	.
inflation	-.0002395	.0102147	-.0104542	.

b = consistent under Ho and Ha; obtained from xtreg  
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(11) = (b-B)'[(V\_b-V\_B)^(-1)](b-B)  
 = 35.38  
 Prob>chi2 = 0.0002  
 (V\_b-V\_B is not positive definite)

. xtabond2 child\_mortality \$xlist, gmm( child\_mortality exd\_gni ds\_exp ext\_exp , lag(2 2)) iv(\$Xlist ) small  
 Favoring speed over space. To switch, type or click on mata: mata set matafavor space, perm.  
 Warning: Number of instruments may be large relative to number of observations.

Dynamic panel-data estimation, one-step system GMM

Group variable: c_id	Number of obs	=	292
Time variable : year	Number of groups	=	38
Number of instruments = 58	Obs per group: min	=	3
F(8, 283)	=	11753.07	avg = 7.68
Prob > F	=	0.000	max = 8

child_mort~y	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
gdpc	-.0048363	.0003849	-13.63	0.000	-.0055348 -.0041378
exd_gni	-.2304329	.0315779	-7.30	0.000	-.2925903 -.1682755
ds_exp	-.7739568	.0956283	-8.09	0.000	-.9621898 -.5857238
ext_exp	-.0138321	.0010935	-12.65	0.000	-.0159844 -.0116797
gfcf	-.2890856	.0920721	-3.14	0.002	-.4703186 -.1078525
trdop	.1004284	.029541	3.40	0.001	.0422804 .1585763
no_violence	-.4424122	.0512528	-8.63	0.000	-.5432974 -.3415271
inflation	.3434717	.0892703	3.85	0.000	.1677537 .5191897
_cons	114.7222	2.166175	52.96	0.000	110.4583 118.986

Instruments for first differences equation  
 GMM-type (missing=0, separate instruments for each period unless collapsed)  
 L2.(child\_mortality exd\_gni ds\_exp ext\_exp)

Instruments for levels equation  
 Standard  
 \_cons  
 GMM-type (missing=0, separate instruments for each period unless collapsed)  
 DL.(child\_mortality exd\_gni ds\_exp ext\_exp)

Arellano-Bond test for AR(1) in first differences: z = -1.31 Pr > z = 0.190  
 Arellano-Bond test for AR(2) in first differences: z = -0.66 Pr > z = 0.511

Sargan test of overid. restrictions: chi2(49) =1240.15 Prob > chi2 = 0.000  
 (Not robust, but not weakened by many instruments.)

Difference-in-Sargan tests of exogeneity of instrument subsets:  
 GMM instruments for levels  
 Sargan test excluding group: chi2(19) = 37.89 Prob > chi2 = 0.006  
 Difference (null H = exogenous): chi2(30) =1202.27 Prob > chi2 = 0.000