SAINT MARY'S UNIVERSITY

SCHOOL OF GRADUATE STUDIES

THE EFFECTS OF FOREIGN AID ON ECONOMIC GROWTH IN SUB SAHARA COUNTRIES: EMPIRICAL EVIDENCE FOR PANEL DATA

By

TSEGAZEAB LEMLEM TESFAYE

JULY, 2022

ADDIS ABABA, ETHIOPIA

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A THESIS SUBMITTED TO ST.MARY'S UNIVERSITY, SCHOOL OF GRADUATE STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS IN DEVELOPMENT ECONOMICS

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DECLARATION

I, the undersigned, declare that this thesis is my original work, prepared under the guidance of Wondimagegne Chekol (PhD). All sources of materials used for the thesis have been duly acknowledged. I further confirm that the thesis has not been submitted either in part or in full to any other higher learning institution for the purpose of earning any degree.

Name	**Signature**
Tsegazeab Lemlem Tesfaye	**July, 2022**

ENDORSEMENT

This thesis has been submitted to St. Mary's University, School of Graduate Studies for examination with my approval as a university advisor.

Advisor	**Signature**
Wondimagegne Chekol (PhD)	**July, 2022**

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APPROVAL

As members of the Board of Examining of the final MA thesis open defense, we certify that we have read and evaluated the thesis prepared by Tsegazeab Lemlem Tesfaye under the title *'The effects of foreign aid on economic growth in sub Sahara countries;* empirical evidence for panel data*'*. We recommend that this thesis be accepted as satisfying the thesis requirement for the degree of Master of Art in Development Economics.

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July, 2022

Tsegazeab Lemlem

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Acronyms and Abbreviations

DAC: Development Assistance Committee

GDP: Growth Domestic Product

MDGs: Millennium development goal

ODA: Official Development Assistance

OECD: Organization for Economic Co-operation and Development

WB: World Bank

WDI: World Development Indicator

WGI: World Governance Indicators

SSA: Sub Sahara Africa

ABSTRACT

This study examines the effect of foreign aid on economic growth in 12 selected sub Sahara developing countries. Using panel data from 12 countries from 1993 - 2019, in to fixed effect model and random effect models. The key variables of this study are GDP, foreign aid, measured by the official amount of foreign aid as a percentage of GDP by the recipient countries, Exports of goods and services, capital formation, population growth rate and domestic savings. Several potential variables that can impact economic growth are controlled for to assess the foreign aid-growth relationship. The study finds that, after controlling for other factors, foreign aid has positive effect on economic growth. The insignificant variables in the regression are Gross Domestic Savings as a percentage of GDP and export of goods and services as a percentage of GDP. The effect of population growth and gross capital formations are statistically significant on real GDP growth rate. It means that foreign aid and economic growth have statistically significant relationship. These findings suggest two lessons for policymakers. First, foreign aid should be used in expectation of increasing economic growth of recipient countries. Second, foreign aid may be effective in improving the developments of those countries. This suggests that future research should focus on in-depth, country-specific, sector based, case studies.

Key Words: Foreign aid, Economic Theory, gross domestic product, panel models, sub - Sahara countries

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the study

Many countries in the world today engaged in the multidimensional process of foreign aid either as receivers, contributors, or as both receivers and contributors. Africa is the biggest foreign aid recipient continent in the world. Developing counties claim for more foreign aid is based on the propositions that there is a positive relationship between the volume of capital inflow, governance quality and the rate of economic growth. But the validity of this basic proposition has not yet been conclusively verified for developing countries as a whole.

ODA disbursement to developing countries increased almost five-fold; from around US$36 billion in 1960 to US$176 billion in 2016 and $178.9 billion in 2021. (WDI, 2022) According to Sollenberg, (2012) for the last many years billions of dollars are sent in as foreign aid and development assistance to developing countries specifically to Africa with the aim to alleviate hunger, end poverty, foster economic growth and development, democratic institutions, governance quality, and the rule of law without violating the clear sovereignty and peace of those countries.

Most African countries have led to a lot of antagonism against foreign aid due to high levels of dependence on foreign aid. The effects of foreign aid for economic growth in donor and recipient countries are largely debatable due to various arguments for and against the benefits of foreign aid in theory and data analysis. According to Arshad Khan and Ayaz Ahmed (2007) foreign aid is complements and supplements with economic growth because it provides additional financial resources which support in advancing a country's economical, social and political environment.

On the other side, others argue that foreign aid can increase national savings and promote aid dependency, which can, in turn, negatively affects investment and economic growth. Those researchers explains that foreign aid leads to aid-dependency through a side source of income to political leaders in receivers countries which determined to ensure their dominance of the political and economic scene of their countries to avoid losing the side source of income in other side. (Boone (1996), Burke and Ahmadi-Esfahani (2006), Easterly (2003), Rajan et al. (2008) and Rao et al. (2020))

Many economist analysts (Collier 1997; Dollar and Pritchett 1998; Stiglitz 1999; Kapur and Webb 2000) conclude that conditioning aid on policy and governance reform is largely ineffective raising doubts about

the capacity of donors to enhance the quality of governance in recipient countries through imposing governance quality related preconditions on foreign aid acceptance and follow up.

According to Crawford (1997) from an examination of 29 cases in which politically motivated aid sanctions were practiced, summarizes that political conditionality is usually ineffective practically rather than its theoretical effectiveness.

Much of the foreign aid to developing countries is aimed to promote economic development and welfare. Capital has been transferred to some developing countries for decades. A vast amount of literature has been directed towards studying the relationship between foreign aid and economic growth. According to Easterly (2003) pointed out that economic research on the impact of foreign aid on economic growth often becomes a political football. Economists failed to consider the context of such research and the result has been different than the original demonstration of the research. The reason behind this is the fact that economic research on foreign aid has generated mixed results for different regions of the world.

The question to what extent foreign aid contributes to enhance economic development in sub – Sahara African countries has gained new prominence in the recent African dialogue. The purpose of this study would be to assess the effects of foreign aid on economic growth of sub-Sahara countries through panel data methodology from 1993 – 2019.

1.2 Statement of the problem

The impact of foreign aid on economic growth has been a debated issue, particularly for African countries, as the empirical results failed to provide a generalized finding. It is an appropriate time for foreign aid contributors and receivers to take stock of the foreign aid experience.

There is no concrete consensus about the relationship between foreign aid and economic growth in developing countries. Empirical studies on the impact of foreign aid on economic growth in particular and on development have also produced mixed results. Moreover, studies conducted in different countries have also yielded results of divergent characteristics. Many have manifested a credible positive link between foreign aid and growth (Levy (1988); Gounder (2001); Hansen & Tarp (2001); McGillivray (2006); Loxley & Sackey (2008); Gomanee, Girma, and Morrissay (2005); Nilsson (2013); Karras (2006); Tra (2014); Asteriou (2009)), while others have observed a significant negative association (Boone (1996); Mallik (2008); Easterly (2003); MM (2016); Alemayehu (2011); Tendongho (2016); Rajan et al. (2008); Rao et al. (2020)). Besides, a group of researchers did not find any connection between the two, or if there was a relationship, it was very little or not very worthy (Burnside & Dollar (2000); Picciotto (2009); Rwabutomize (2008); Eregha & Oziegbe (2016); Burke and Ahmadi-Esfahani (2006); Khan & Ahmed (2007)).

This study focuses on three primary issues. First, what are the major effects of foreign aid on economic growth? Thus, while it is useful to draw an empirical relationship between foreign aid and economic growth there is no solid consensus among previous researchers on the actual effects of foreign aid inflows and the actual impacts of foreign aid in developments.

Some research scholars and experts of foreign aid argue that foreign aid has positive growth impact while others support its negative impact. Even others further propose that there is no significant relationship between the two. second, this study explained and fill the gap whether foreign aid has a significant and positive impact on economic growth of selected 12 sub – Sahara countries i.e., using recent year's panel data (from 1993 - 2019); third, it explained what are the possible policy alternatives.

1.3 Basic research questions

This study addressed this basic research question:-

1) What are the major effects of foreign aid on economic growth in sub-Sahara countries?
2) What are the trends of foreign aid in sub – Sahara countries?

1.4 Objectives of the study

1.4.1 General Objective

The general objective of this study would be to assess the effects of foreign aid on economic growth of selected sub – Sahara countries from 1993 - 2019.

1.4.2 Specific objectives

The study incorporates the following specific objectives;

I. To show the trends of foreign aid in sub Sahara countries
II. To see the effects of foreign aid on economic growth in sub – Sahara countries

1.5 Significance of the study

This study will contribute to the existing literature by extending the works of others and help in filling the knowledge gaps in this area. Furthermore, the results of the study will help the concerned policy makers with the appropriate ways of intervention to go for appropriate policy set up and good macroeconomic environment that favors the foreign aid positive effectiveness in promoting economic growth and enhancing governance quality.

1.6 Scope & limitations of the Study

Different studies have been conducted on the determinant factors of aid effectiveness and economic growth in developing countries particularly in sub – Sahara countries.

Attributing specific economic or political development in a country to a particular source of foreign aid with relation to sectors (social, educational, healthy, tourism, agricultural, manufacturing, constructions - - - etc), ideology, democracy, peace and security, preconditions, interventions concepts are beyond the scope of this study. The reasons are the variety and multidimensional complex nature of the world. Although the regions comparisons provide a more in-depth view of the economic development process related to foreign aid, this study does not discuss every detail factors of foreign aid effectiveness from donor's perspectives.

Proponents of the governance quality agenda see it as a worthy goal not only in and of itself, but also as a means through which to accelerate a variety of other economic outcomes, particularly economic growth and sustainable development. But this study focused in foreign aid effects in economic growth only.

In addition to this, the study limits to the general effect of foreign aid on economic growth in selected 16 sub – Sahara African countries (on the process of this thesis 4 countries are excluded because of data unbalance & inconsistency) and this study focused on the period from 1993 up to 2019

1.7 Hypothesis

This thesis hypothesis is:

Hypothesis 1: there is no statistically significant relationship between foreign aid and economic growth in the sub – Sahara countries.

For testing the first null hypothesis, one econometric model were used; one with main determinants of economic growth variables and foreign aid variable.

1.8 Organization of the thesis

This study consisted five chapters as follows:-

Chapter I: explained the introductory discussions of the study, problem statement of the study, objective of the study and significance of study.

Chapter II: discussed the literature review of economic theories, foreign aid and economic growth in view of different research papers and books from around the world. It included theoretical and empirical reviews and the conceptual framework.

Chapter III: focused on introducing the methodology of the research. It explained the nature of the study, the econometrics models would be used, data collection methods, what sources this data retrieved from, and then clarifies the scope of the study.

Chapter IV: This chapter described the estimation and results of scientific tests that would be applied. This further explained which specific tests would be applied, step by step, to check stationary of panel data and to investigate the relationship of foreign aid with economic growth in sub – Sahara countries.

Chapter V: This chapter concludes and provides policy recommendations and also shows some direction for further research.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Foreign Aid Definition

Relatively, Official assistance is a new debatable topic in economics. The classics economists —Smith, Ricardo, and Stuart Mill, for example—didn't address the subject in any significant way.

The standard definition of foreign aid stated from the Development Assistance Committee (DAC) of the Organization for Economic Cooperation and Development (OECD), which explains "*foreign aid (foreign assistance) as financial flows, technical assistance, and commodities that are*

(1) Planed to promote economic development and welfare as their major objective (thus excluding aid for military or other non-development purposes); and

(2) Are supported as either grants or subsidized loans."

2.2 Theoretical

2.2.1 Economic Theories and Models

2.2.1.1 Solow – Swan Model

Solow-Swan model describes the long-run economic growth within the framework of neoclassical economics. It explains the economic growth in the long run by capital accumulation, labor growth and technology improvement. The production function is of Cobb-Douglas type which connects with microeconomics (Solow, 1956).

$$(t) = (t)(A(t)L(t))^{1-\alpha} \qquad 0<\alpha<1$$

Where:-

Y(t) is total production at time t.

K represents capital.

A represents technology progress

L represents labor.

The growth rate of capital stock is:

$$\dot{k}(t)=sy(t)-(\delta+n+g)k(t)$$

The first term on the right-hand side is investment, s is the output per unit of labor that is saved and invested. δ is the depreciation rate; n is the growth rate of labor force and g represents the growth rate of

technology which is exogenous. Capital stock depends positively on saving rate and negatively on depreciation rate and growth rate of labor. At steady state, the growth rate of capital equals the growth rate of output per labor. (Solow, 1956).

2.2.1.2 Harrod-Domar Model and GAP models

Different theoretical and empirical studies of the foreign aid-growth relationship carried out until the mid-nineties were influenced by the early growth theories, which asserted that the growth process depends on the ability to surpass the constraints regarding the accumulation of physical capital. Investment was perceived as the key to economic growth.

Traditionally, the lack of savings crucial to investment was regarded as the most important limitation to the economic growth of developing countries. Indeed, one characteristic of developing countries is their limited capacity to generate savings, due to their low per capita income. The original Harrod-Domar model was expanded in the sixties in the Chenery and Strout (1966, 1979) two-gap model. The foreign exchange shortage was introduced as another possible growth constraint. Typically, developing countries need to import goods and services, vital to investment and production; but import requirements usually exceed export earnings.

Investment can be constrained either by a shortage of domestic savings (the savings gap) or by a shortage of exports earnings (the trade gap). Therefore, foreign aid inflows in particular, and foreign capital inflows in general, are needed to fill the prevailing gap, so that countries can grow more rapidly than their internal resources would otherwise allow. If these inflows do not exist, the country will experience slower growth and inefficient employment of internal resources (labour and natural resources). The desirable outcome is self-sustaining growth. (Chenery and Strout (1966, 1979))

2.2.1.3 Two – Gap Model

The theoretical foundation for the proposition that aid can promote economic development is the 2-gap model (McKinnon 1964), which posits that development may be hampered in the developing countries by the existence of two gaps, viz., the savings gap and the foreign exchange gap. The savings gap arises from the fact that domestic savings, for various reasons, tend to be low in the typical developing country. Thus, savings will inevitably fall short of the 'required investment', i.e., the investment needed to grow at a target rate. Foreign savings in the form of aid can fill this gap.

The role of foreign capital in this sense is that it permits the developing country to invest more than it can save domestically. Similarly, the import surplus, or balance-of-payments deficit, constitutes a foreign exchange gap, which can naturally be filled by aid flows. It has been argued that even when a country has

enough savings, it may not be able to 'transform' the savings into foreign exchange for the purchase of needed capital imports. Thus, there can be a foreign exchange gap without a savings gap. (McKinnon 1964),

There can also be a savings gap without a foreign exchange gap. At times both gaps exist. With respect to the foreign exchange gap, many analysts believe that capital imports, financed by aid flows, will accelerate the rate of capital formation by their very nature (Iyoha 2004b). This two-gap model is akin to the original Harod-Domar model which indicates that investment is constrained by insufficient domestic savings or limited foreign exchange needed to import capital goods.

Beyond the two-gap model utilized by McKinnon (1964), Chenery and Bruno (1962), and Chenery and Strout (1966), a three-gap model was explored by Bacha (1990) by adding the fiscal-gap when domestic tax revenues are insufficient for financing public investment projects or other investments, and the government needs foreign aid to supplement domestic revenue sources. The effect of foreign aid on economic growth can be transmitted via its impact on investment, private and government consumption, as well as capital accumulation.

Therefore, to increase the level of investment and hence growth, finance gap can be filled through aid (Hanson and Tarp 2000). Even where no finance gaps exist, aid can change the equilibrium level of investment by raising private investment through improved infrastructure.

Several reasons have been given to buttress the view that aid might not promote growth. These include: mismanagement (waste), corruption, likelihood of currency appreciation that will erode the profitability of the production of all tradable goods (Dutch disease), reduction in savings (both private and government), perpetuating bad governments in power, and hence poor economic policies (Radelet et al. 2004).

2.2.1.4 Three –gap Model

Following the crippling debt crisis of the 1980s, Bacha (1990) and other Sandrina Berthault Moreira neostructuralist authors, like Lance Taylor, introduced a third fiscal gap between government revenue and expenditures. The three-gap model predicts that government budget limitations rather than foreign exchange constraints or an overall savings restriction, may be binding. If foreign aid supplements government revenue, then it will be perceived as promoting economic growth.

2.2.1.5 The dependency theory and foreign aid

Dependency is defined as an explanation of the economic development of a state in terms of the external influences, economic, and cultural political, about national development policies (Osvaldo Sunkel, 1969).

Theotonio dos Santos (1971) emphasizes the historical measure of the dependency relationships which shapes a certain structure of the world economy such that it helps some countries to the harm of others and limits the development possibilities level of the subordinate economics or a situation in which the economy of a certain group of countries is conditioned by the development and expansion of another country or economy, to which they are subjected.

2.2.2 Overviews of foreign aid developments in history

Table 1. Overviews of foreign aid developments in history

Decades	Dominant or rising institutions	Donor ideology	Donor focus areas	Types of aid
1940s	Marshal Plan and UN system (including World Bank)	Planning	Reconstruction	Marshall Plan was largely programme aid
1950s	USA, with Soviet Union gaining importance from mid 1950s	Anticommunist, but with role for the state	Community Development Movement	Food aid and projects
1960s	Establishment of bilateral programmes and regional development banks (including ADB, AfDB and IDB)	As for the 1950s, with support for state in productive sectors	Productive sectors (e.g. support to the green revolution) and infrastructure	Bilateral donors gave TA and budget support; multilateral donors gave project aid
1970s	Expansion of multilateral donors (especially World Bank, IMF and Arab-funded agencies)	Continued support for state activities in productive sectors and meeting basic needs	Poverty, taken as agriculture and basic needs (such as health and education)	Fall in food aid and start of import support
1980s	"Washington Consensus" and rise of NGOs from	Market-based adjustment (rolling back the state)	Macroeconomic reform and liberalization	Financial and structural adjustment aid and

	mid-1980s			debt relief
1990s	Eastern Europe and FSU become recipients rather than donors; emergence of corresponding institutions (EBRD)	Move back to the state toward end of the decade	Support to political and economic transition, poverty and governance	Move toward sector support at the end of the decade
2000s	Bilateral aid agencies expanded aid flows (especially USA, establishment of MCC) and surge in private aid (remittances)	Move toward performance based aid allocation	MDGs, global health (HIV/AIDs), security and governance	Continued sector support with special focus on social sector

Note: Entries are main features or main changes;

Source: Reproduced from Hjertholm and White (2000), p.81, Table 3.1., with revisions and additions.

2.3 Foreign aid and economic growth

According to Chenery (1965) and Papanek (1972) the theoretical development of the 1950's and 1960's, the traditional pro-aid view states that foreign aid complements the recipient economies' domestic resources, relieves foreign exchange constraints, helps to transfers modern know-how, and support easy access to global market–all of which contribute to positive economic growth.

Most research and literature on foreign aid and growth focus on the criteria for the allocation of aid, the impact of the aid on the economy of the receivers and most recently on the background factors enhancing or hampering the effectiveness of foreign aid vis-à-vis economic growth.

According to Cungu and Swinnen (2003), use a basic conceptual view to show how they think aid can contribute to economic growth via foreign aid receiver's production function.

$$Y = y(K, H, T) \qquad (1)$$

Where Y is output and K, H, T are physical capital, labour augmenting human capital and state of technology respectively.

This interpretation of the effect of foreign aid on economic growth has been supported in the literature by (Hansen and Tarp, 2001; Burnside and Dollar, 2000).

In their view, foreign aids raise a country's scarce financial capital, upgrade the stock of human capital and support technological transfers. In addition, some spillover effects might be associated with the provision of external finance when the involvement of international aid organizations promotes the receivers credibility, helps build up confidence and improves the business climate in the receiver's economy.

Neanidis and Varvarigos (2005) explain that foreign aid accelerates economic growth on average when used effectively, that is allocated by recipient's government to the most economic productive uses. A greater amount should be allocated to productivity-enhancing public spending in the technologies which improves human capital. Their empirical work is done by using a representative agent framework. In this model individuals produce a perishable commodity and spend resources for improving productivity. The governments on its part spend resources for to provide productivity enhancing public goods and services. Each period the government receives foreign aid stipends which it allocates between lump-sum income transfers and the provision of productive public spending. Their result show that when aid is used

productively (unproductively) it has, on average, a positive (negative) effect on growth while its respective volatility has a positive or negative effect.

According to Khalil Osman (1998), Foreign aid is a supplement to the low levels of domestic savings in low income developing countries thereby empowering them to enhance their rates of investment which leads to accelerated economic growth and poverty reduction. However in ground foreign aid has not increased growth significantly. He notes that countries that receive greater amount of aid do not experience faster growth. He notes that African countries which enjoy aid-GNP ratios more than ten times their Latin American and East Asian counterparts, suffer inferior economic performance. To him aid is insufficient in amount compared to the bulk of problems in the developing world and the target set by developed countries has been met only by a few small donors; namely Norway, Sweden, Denmark and the Netherlands. Effectiveness, he stresses lies on a keen selective criterion by contributors; development projects objectives of the receivers should be taken into account before allocating aid.

According to Brautigm and Knack (2004) Foreign aid upgrades governments capacity to enhance their public institutions by providing educational and technical support aimed at building meaningful legislative, executive, and judicial systems to upgrade the effectiveness and efficiency of governance functions. Foreign aid can further improve governance and respect for the rule of law by reducing corruption through the management of a country's expenditure and revenue creation in a legitimate manner.

Theory is enigmatic with respect to foreign aid's impact on the quality of governance in developing countries. According to Van Rijckeghem and Weder (1997) there are various reasons to related foreign aid enhance governance quality. Incapable institutions and policies are often deliberately chosen by self-centered leaders with short time horizons. In other side, low government revenues could be a binding constraint on the economic development of well-functioning governmental and legal systems. Foreign aid may be devoted in part in some countries to support research, capacity building mechanism and improved salaries for public employees, including police, judges and tax collectors. As salaries improved, more competent bureaucrats can be recruited; corruptions and inefficient use of resources minimized.

2.4 Empirical

According some researchers foreign aid has no effect on growth, and may actually undermine growth due to various reasons like:-

A number of studies have suggested a variety of reasons as to why aid might not support growth:

I. highly encourage different types of corruptions

ii. It perpetuates poor economic strategies, policies and postpones many forms of reforms.

iii. Due to lack of efficient capacities in developing countries it reduces foreign aid effectiveness.

iv. It leads to reduction of both public and domestic savings. (Boone 1994, Dowling and Hiemenz 1982, Rajan and Subramanium 2005)

After analyzing 97 studies, Doucouliagos and Paldam (2005) (cited in Sebastian Edwards, 2014) they concluded that there was a small positive, and yet statistically insignificant, relationship between official foreign aid and economic growth.

This summary was also supported by Rajan and Subramanian (2008) in an analysis that corrected for potential endogeneity problems, and that considered a comprehensive number of variables. In particular, according to their study there is no significant relation running from more foreign aid to faster economic growth; this is true even in countries with better policy environment and stronger institutions.

Official development assistance (ODA) flows have a positive impact on economic growth, but this positive impact is conditioned by the existence of capable institutions, peaceful and democratic political environment as well as many other elements (Burnside and Dollar, 2000; World Bank, 1998, Easterly; Levine and Roodman, 2004).

According to Burnside and Dollar (1997) studies which was a response to critics of the official development assistance shows that the effectiveness of foreign aid is preconditioned by the enhancements of governance quality in recipient countries. For some, their favorable democratic governance allows for better use of ODA that will maximize its productivity and capability; Moreover, democracy is one of donors' criteria for granting ODA; donors will likely give more ODA to countries with good democratic qualities (Akramov, 2012).

According to Elisa & Slengesol (2001) Developing countries which have a sound policies and high-quality government institutions have grown faster than those without having them. The high-management, good-aid groups grew much faster, at 3.7% per capita GDP.

Table 2: Summary of foreign aid and economic growth empirics

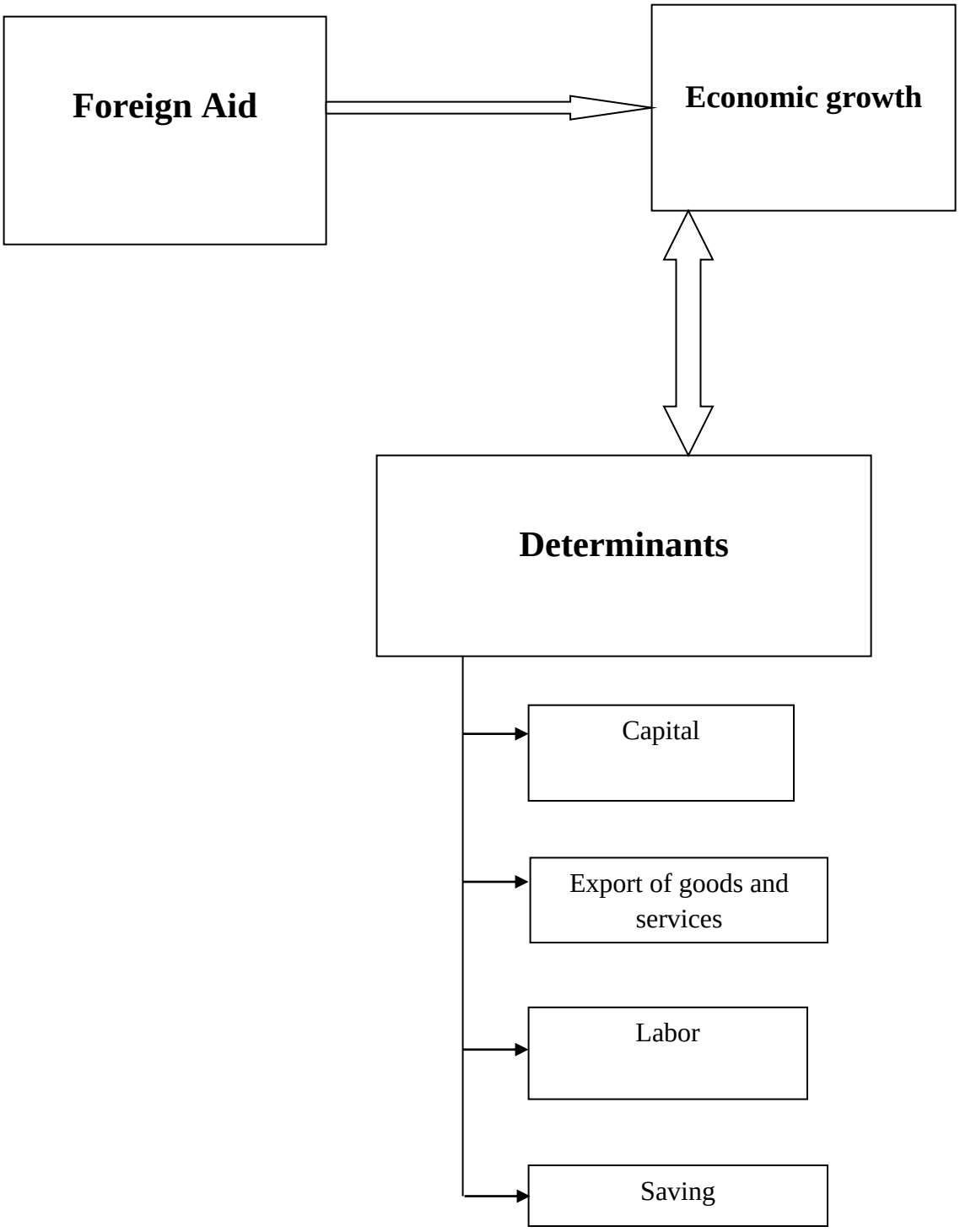
Study and year	Time period	Countries	Research Findings	Techniques
Levy (1988)	1968 - 1982	Sub-Saharan African countries	a significant and positive relationship between the ratio of aid to GDP and economic growth	Panel data
Boone (1996)	1971-1990	96 countries	aid does not increase investment significantly nor benefit the poor	a broad dataset – panel data
Burnside and Dollar (2000)	1970 – 1993	56 countries, mostly from Africa and Latin America	aid has a positive impact on growth in countries that have good fiscal, monetary and trade policies	Multivariate Regression Analysis (Panel data)
Easterly (2003)	1970-1997	Panel data of 56 countries	Negative/Insignificant impact	Multivariate Regression Analysis
Gomanee, Girma, and Morrissay (2005)	1970 to 1997	25 Sub-Saharan African countries	foreign aid had a significant positive impact on Economic growth.	Panel data
Burke and Ahmadi-Esfahani (2006)	1970-2000	Philippines, Indonesia and Thailand	aid does not have significant effect on growth rates	Panel data
McGillivray (2006)	1968-1999	African countries	foreign aid to African countries not only increases Growth but also	time series data

			reduces poverty.	
Karras (2006)	1960 to 1997	71 aid receiving developing countries	positive impact of foreign aid on economic growth that was permanent and statistically significant	Panel data
	-			
Rajan et al. (2008)	1960-2000	Panel data various countries	Insignificant/ non-robust even in good policy countries	OLS regression Analysis
Rwabutomize (2008)	1990 - 2004	Sub Saharan Africa (SSA) region	increases in foreign aid inflows will not have a positive effect on promoting economic growth in the region	Arellano-Bond dynamic panel data
Picciotto (2009)	-	Time Series for in 55 different countries	Insignificant/ modest depending on country's conditions	OLS regression Analysis
Asteriou (2009)	1975-2002	South Asian countries	aid has a positive effect on economic growth in short- and long-run	Panel data
Alemayehu (2011)	1960 - 2005	34 African countries	Aid does not have a direct effect on human development (infant mortality) and aid has an insignificant relationship with the educational sector.	time series analysis

Nilsson (2013)	1995-2011	Sub Saharan Africa (SSA) region	Aid has a direct and positive effect on growth when it allocates into a social-infrastructure sector which is included health, education, provision of clean water, and sanitation. While, aid allocated into economic-infrastructure, which includes trade and financial sector, might not generate economic growth in the short-run, but it does in long-run.	Panel data
Rao et al. (2020)	1980-2016	21 South Asian and Southeast Asian developing countries	negative impact of aid on growth	Panel data

Source: Constructed by author

2.5 Conceptual framework on the Foreign Aid -Growth nexus



Economic growth is an increase in the ability to produce more and more goods and services. This are mainly caused by more resources, better resources and through better technology. If we only had more resources we could produce more goods and services and satisfy more of our wants. This will reduce

scarcity and give us more satisfaction (more goods and services). All societies therefore try to achieve economic growth.

The causes of under development are complex and multidimensional. The most important problems of this are the problems of unemployment and inflation. They involve, among other things, culture, climate, gender, markets and public policies. Economic stability, competitive markets and public investments in physical and social infrastructure are widely recognized as important requirements for achieving sustained economic growth.

Since the economic growth of countries is influenced by several factors including savings, investments, human capital, and international trade, various empirical studies on the effects of aid on growth have included different variations of these variables. This conceptual framework describes the relationship between economic growth and foreign aid, determinants of economic growth. The effects are positive, negative and neutral depending in where, when, for whom and how the situations are determining the existing reality.

2.6 Foreign Aid in sub Sahara countries

2.6.1 Patterns of Foreign Aid in sub – Sahara

Aggregate trends in net ODA to developing countries from only $25.6 billion in 1960, in constant 2003 prices and exchange rates, total net ODA flows from all donors reached $73 billion in 2004 & $178.9 billion in 2021. While there is a clear upward trend in total aid flows. Per capita aid flows were unstable during different time periods. (WDI, 2022)

Despite the overall upward trend, total net ODA flows have experienced downward trends or were flat during some periods. For example, during the 1980s net ODA flows similarly to other capital flows to developing countries remained stagnant as a result of widespread debt crisis in developing countries.

2. 7 Annual growth rate in selected sub Sahara countries

This section shows average annual growth rate for each selected sub Sahara countries from 1993 – 2019.

Table 3. Average - annual growth rate of each country

No	Regions	Countries	Average years in decade		
			1993 – 2002 (10 years)	2003 – 2012 (10 years)	2013 – 2019 (7 years)
1.	Western Africa	Nigeria	3.263847	6.803187	2.707707
		Mali	5.145226	4.263942	5.173136
		Niger	2.699286	5.011894	5.749196
		Senegal	3.22954	3.488862	5.625529
2.	Central Africa	Dem Rep of Congo	-3.52669	6.018231	5.885773
		Cameroon	2.745167	3.91986	4.555692
		Central African	2.762708	3.540482	-2.27239

		Rep			
		Chad	2.906986	9.938927	1.677808
3.	Eastern Africa:	Ethiopia	2.330077	6.728437	6.422443
		Kenya	2.2536	4.855415	4.632134
		Tanzania	4.067018	6.441803	6.367491
		Uganda	10.06325	7.318722	4.933735
4.	Southern Africa:	Mozambique	8.608327	7.36791	4.915621
		Malawi	1.321959	2.973348	1.487723
		Zambia	0.256496	4.853591	0.557113
		Zimbabwe	0.557842	-0.0546	-0.1177

Source: Calculated by Author from WB WDI data, 2022

Table 3: shows the average annual growth rate of each selected countries which have below 10% except Uganda 10.063225% average 1993 to 2002. 7 countries Ethiopia, Malawi, Nigeria, Niger, Senegal, Zambia & Cameroon average annual growth rate increase from period 2003 – 2012 to 2013 – 2019 but 9 countries Mali, Dem Rep of Congo, Central African Rep, Chad, Ethiopia, Kenya, Tanzania, Zimbabwe, Uganda & Mozambique average annual growth rate decrease from period 2003 – 2012 to 2013 – 2019. Ethiopia & Tanzania have the highest 6.422443% and 6.367491% respectively.

2.8 Foreign aid (by % GDP) for each selected country

This section shows the average foreign aid (by % GDP) for each selected countries from 1993 – 2019.

Table 4. Average annual foreign aid (by % GDP) of each country

No	Regions	Countries	Average years in decade		
			1993 – 2002 (10 years)	2003 – 2012 (10 years)	2013 - 2019 (7 years)
1.	Western Africa	Nigeria	0.044259	0.105515	0.090666
		Mali	1.353613	1.03375	1.335234
		Niger	1.141399	0.961867	1.363315
		Senegal	0.800305	0.65014	0.705017
2.	Central Africa	Dem Rep of Congo	0.349609	1.619325	0.896287
		Cameroon	0.436585	0.357243	0.382616
		Central African Rep	1.219819	1.010739	3.911433
		Chad	1.348587	0.477945	0.765482
3.	Eastern Africa:				
		Kenya	0.484567	0.422085	0.48968
		Tanzania	1.080036	0.920236	0.713005
		Uganda	1.313901	0.902771	0.822428
4.	Southern Africa:	Mozambique	2.498682	1.577094	1.793189

Source: Calculated by Author from WB WDI data, 2022

Table 4: shows the average foreign aid (by % GDP) for each selected countries from 1993 – 2019 which have less 2 % for all selected countries except Central African Rep 3.911433% from 2013 – 2019 & Mozambique 2.498682% from 1993 - 2002. 4 countries Nigeria, Dem Rep of Congo, Tanzania & Uganda average foreign aid (by % GDP) decrease from period 2003 – 2012 to 2013 – 2019. While 8 countries Mali, Niger, Senegal, Cameroon, Central African Rep, Chad, Kenya & Mozambique average foreign aid (by % GDP) increase from period 2003 – 2012 to 2013 – 2019. Central African Rep & Mozambique have the highest Central African Rep and 1.793189% respectively.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1. Research Design

The study used both qualitative and quantitative research methods. Qualitative research methods applied to explain results and the possible means of interpretations and to obtain systematic sequence of information to get into the depth of study problems. On the other hand, quantitative research methods used to provide numerical measurement and analysis of the magnitude and extent of the effects of foreign aid on economic growth in sub Sahara African countries.

3.2. Population and Sampling Techniques

This study used 1993-2019 panel data from 16 developing countries in sub-Sahara African countries to analyze the impact of foreign aid on economic growth. The sample countries include 4 countries from Central Africa (Dem Rep of Congo, Cameroon, Central African Rep, Chad), 4 countries from Eastern Africa (Ethiopia, Kenya, Tanzania, Uganda), 4 countries from Southern Africa (Mozambique, Malawi, Zambia, Zimbabwe) and 4 countries from Western Africa (Nigeria, Mali, Niger, Senegal). These countries selected for this study as they provide a good sample of moderately to heavily aid-dependent developing countries with dubious quality of governance. But on the process of this thesis work 4 countries (Ethiopia, Malawi, Zambia & Zimbabwe) excluded because of data inconsistency and unbalance. This selected countries consisted 67.1765% of total Sub Sahara population in 2019. (WDI, 2022)

3.3. Types of Data and Tools Instruments of Data Collection

Since the primary interest of this paper is to examine the relationship between foreign aid and economic growth with addition to other determinants of economic developments in selected 12 sub Sahara countries. Data were obtained for the years of 1993 through 2019 (27 years) for 12 developing countries of which the list are made available in the Appendix 1, running the data analysis done through foreign aid – growth model as follows:-

3.3.1 Model I

The selection of variables for this study took these empirical studies into consideration; however, our model is based on the objectives of this study and the availability of data.

The foreign aid-growth model is expressed based on neoclassical economic theories as follows:

GDP = (ForeiAid, Gfcap, GDS, Exp, Pop) ---------- (1)

Where, GDP = Annual Gross Domestic Product (current US$);

ForeiAid = foreign aid (Net official development assistance and official aid received (current US$) - (% of GDP));

GDS = Gross domestic savings (% of GDP);

Gfcap = Gross fixed capital formation (% of GDP)

Exp = Exports of goods and services (% of GDP);

Pop = annual growth rate of Population,

Pooled OLS (POLS), Random Effects (RE), Fixed Effects (FE), and Fixed Effect Robust (FERB) regression models were used to examine the effects of foreign aid on economic growth as follows:

$$GDP = \beta_0 + \beta_1 \text{ForeiAid}_{it} + \beta_2 \text{Gfcap}_{it} + \beta_3 \text{GDS}_{it} + \beta_4 \text{Exp}_{it} + \beta_5 P\text{op}_{it} + \varepsilon_{it} \text{ ---------- (1)}$$

Where, the index i = 1,…….. , N refers to countries,

The index t = 1,…….. T refers to the period of time, and ε_{it} is the error term.

Equation 1: This equation is the main equation for the aggregate effect of aid on economic growth. It attempts to answer the first research questions.

Moreover, a Breusch-Pagan Lagrange multiplier (BPLM) test applied to evaluate whether the POLS model is suitable for this study or not. A Hausman test used to determine whether RE or FE are the best models for this study. Detail explanation about variables, its measurements and sources of data are available at appendix 3.

Empirical results from the literature provide indication that the effects of Foreign Aid be positive or negative toward GDP.

To prior estimation GDP, Gfcap, ForiAid and Pop variables were transformed into a logarithmic form. The various factors in the model, namely ForeiAid and Pop have been widely used by previous studies; see among others, Bloom and Sachs (1998), Morrissey (2001), Cungu and Swinnen (2003), Dalgaard, Hansen & Tarp. (2004), Rajan and Subramanian (2008), Wu and Hsu (2008), Mitra and Hossain (2013), Galiani, Knack, Xu & Zou (2016) and Yiew, T.H., & Lau, E. (2018)

In some researcher works $ForeiAid^2$ included to investigate the nonlinear relationship between the $ForeiAid^2$ and economic growth (Ekanayake and Chatrna (2010); Clemens et al. (2012); Dreher and Langlotz (2015), Yiew, T.H., & Lau, E. (2018)) and answering the question of possible U-shape relationship (Wamboye (2012); Gyimah-Brempong and Racine (2014)). Two control variables (GDS and Pop) were included in the estimation model to answer the ForiAid's dependency notion. On the other hand, Pop measures the labor force in the country (Bloom and Sachs, (1998); Dalgaard, Hansen & Tarp. (2004); Yiew, T.H., & Lau, E. (2018)). An increase in the labor force is expected to increase economic growth. As such, the sign for Pop is expected to be positive.

3.3.2 Variables, Variable Explanations and Data Sources

	Dependent and independent Variables	Variable explanations	Remark	Sources of data
Dependent Variable	Gross domestic product (GDP);	Gross domestic product (GDP) from the expenditure side is made up of household final consumption expenditure, general government final consumption	GDP (current US$)	**World Development Indicators**
Independent Variables	foreign aid	Net official development assistance is disbursement flows (net of repayment of principal) that meet the DAC definition of ODA and are made to countries and territories on the DAC list of aid recipients. Net official aid refers to aid flows (net of repayments) from official donors to countries and territories in part II of the DAC list of recipients: more advanced countries of Central and Eastern Europe, the countries of the former Soviet Union, and certain advanced developing countries and territories. Official aid is provided under terms and conditions similar to those for ODA. Part II of the DAC List was abolished in 2005. The collection of data on official aid and other resource flows to Part II countries ended with 2004 data. Data are in constant 2018 U.S. dollars.	Net official development assistance and official aid received (constant 2018 US$) [DT.ODA.ALLD.KD]	**World Development Indicators**
	Gross domestic savings	Gross domestic savings are calculated as GDP less final consumption expenditure (total consumption).	Gross domestic savings (% of GDP)	**World Development Indicators**
	Population, total	Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship. The values shown are midyear estimates.	Population, total	**World Development Indicators**

	Gross fixed capital formation;	Gross fixed capital formation (formerly gross domestic fixed investment) includes land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. According to the 1993 SNA, net acquisitions of valuables are also considered capital formation.	Gross fixed capital formation (% of GDP)	**World Development Indicators**
	Exports of goods and services (% of GDP)	Exports of goods and services represent the value of all goods and other market services provided to the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services. They exclude compensation of employees and investment income (formerly called factor services) and transfer payments.	Exports of goods and services (% of GDP)	**World Development Indicators**

Source; World Development Indicator, 2022

3.4. Estimation Methods

This study makes use of panel data for 12 Sub-Sahara countries over a period of 27 years (1993-2019) giving a total of 324 observations. The estimation period is chosen to use 27 years of time-series observations in each country in order to maximize the cross-sectional dimension of the panel to 12 countries. To achieve our objective of determining the relationship between foreign aid and economic growth, we used of models and estimation methods richer than the basic Ordinary Least Squares (OLS) method such as pooled OLS, fixed-effects, random-effects and fixed effects - robust.

Equation (1) is essentially a neo-classical growth model. In addition to the usual factors of growth, i.e. labor (Pop), domestic savings (Gds), and foreign capital (Foreign Aid), two other variables – exports of goods and services (Exp) and gross capital formation (Gfcap), are included as additional determinants of GDP growth**.** Detail explanation about variables, its measurements and sources of data are available at appendix 2.

3.5. Methods of Data Analysis

According to Baltagi (2005) - (pp. 150-153) explains the advantages of panel data over cross sectional or time-series data, which are summarized as follow:

- Panel data control for heterogeneity. They give more informative data, more variability, less collinearity among the variables, more degrees of freedom and more efficiency.

- Panel data are better for studying the dynamics of adjustment.

- Panel data are better for identifying and measuring effects that are simply not detectable in pure cross-sections or pure time-series data

- Panel data models allow us to construct and test more complicated behavioral models than purely cross-section or time-series data.

This study used detail World Development Indicators (WDI) data's with panel data since 1993 up to 2019 with relevant econometrics models.

3.6 Data Sources and Descriptive Statistics

Most of the data for this study were collected from the Word Bank. All data's are collected from the world development indicators. A detailed listing of the variable, variable explanations & sources used in the three models is presented in Appendix 2.

CHAPTER FOUR

4.0 RESULT AND DISCUSSION

Employing the framework developed in chapter 2 and using the data described in chapter 3, this chapter empirically examines the effects of foreign aid on development outcomes particularly to economic growth. Then, the research presents the results of foreign aid allocation models. Thereafter, this research relates the findings to previous literature and development practice**.**

4.1Model I results

Model I tests the aid-growth relationship by using standard growth theory. The findings and results ought to be more comparable to previous studies as most of the previous literature use standard growth theories to study the relationship.

The descriptive statistics shows:-

Table 5 – Summarize descriptive statistics model I

summarize gdpr, foriaid, gds, impexp, pop				
Variable	**Mean**	**Std. Dev.**	**Min**	**Max**
Gdp	3.41e+07	8.17e+07	851174.4	5.47e=08
Gds	7173276	1.95e+07	-62103.1	1.51e+08
Gfcap	20.28984	7.873888	2.1	59.72307
Exp	7023607	1.69e+07	158252.3	1.44e+08
Pop	34081.39	38493.41	3046.148	200963.6
Foriaid	1129044	1097887	51500	1.14e+07

The descriptive statistics presented in Table 5 show that the mean GDP of 3.41e+07 with a standard deviation of 8.17e+07. The mean foreign aid received by the sampled countries is 1129044 with a standard deviation of 1097887. The mean gross domestic savings in the sampled countries is 7173276 with a standard deviation of 1.95e+07. Appendix 4 shows that model we have a strongly balanced panel variable from 1993 up to 2019 with delta one units with addition to 324 observations. The correlation results are in appendix 10.

After estimating both fixed and random models presented in Appendix 5, 6 & 7 – the Hausman test run – (appendix 8) then the test result P > 0.05. Therefore, random effect is more appropriate than fixed effect model. Because:-

In Hausman Test (Fixed Effect or Random Effect) hypothesis;

H0: $\beta 0 = 0$, there is no effect (Random Effect)

H1: $\beta 0 \neq 0$, there is an influence (Fixed Effect)

If H0 is rejected (P-value $<\alpha$) => FE is better than RE, on the other hand, H0 is accepted (P value> α).

The model also test for correlations, Breusch and Pagan Lagrangian Multiplier test, multivariate normality test are presented at appendix 10, 9 & 11 respectively.

Table 6. Results for Random Effects, Fixed Effects, and Fixed Effects Robust Models regressions

Dependent variables	**Gross Domestic Product**		
Sample	**12 countries (27 years)**		
Independent variables	**Model**		
	Random Effects	Fixed Effects	Fixed Effects Robust
Lngds	0.191 (0.03455075)	0.299 (0.0405411)	0.536 (0.0660486)
Lngfcap	0.002** (0.0370158)	0.010*** (0.0388065)	0.187 (0.0715287)
Lnexp	0.145 (0.0363494)	0.085* (0.0434357)	0.454 (0.0967839)
Lnpop	0.002** (0.519231)	0.003*** (0.7320189)	0.045** (0.9770535)
Lnforiaid	0.002** (0.0403966)	0.017** (0.0443086)	0.033** (0.04335184)
CONS			
BPLM	0.1544***		
Hausman	0.3212***		
F/wald Statistics	44.11	6.88	2.12
Pro > F	0.0000	0.0505	0.1395
R - squared	0.1406	0.1307	0.1307
N	323	323	323

Notes: The figures in parentheses (.) are the t statistics and the figures in brackets [.] are the robust standard errors. Asterisks ***, **, * denote statistical significance at the 1%, 5% and 10% levels, respectively. lngdp is annual Gross Domestic Product (current US$); lnforiaid - the official development aid, lnpop is the population, lnexp export CONS is constant and BPLM is Breusch-Pagan Lagrange multiplier.

After estimating both fixed and random models presented in Appendix 5 & 7 – the Hausman test run – (appendix 8) then the test result P > 0.05. Therefore, random effect is more appropriate than fixed effect model.

The results of random effects of model estimator for the aggregate aid flows are presented in appendix 7. The insignificant variables in the regression are Gross Domestic Savings as a percentage of GDP and

export of goods and services as a percentage of GDP. The effect of foreign aid (Net official development assistance and official aid received as a percentage of GDP), population growth and capital formations are statistically significant on real GDP growth rate. And gross domestic savings and export of goods and services are statistically insignificant.

The result shows the higher the foreign aid, the better the GDP growth rate, which leads to selected sub Sahara countries economic progress. More precisely, an upsurge in the foreign aid of 1 percent promotes economic growth, via increasing the GDP growth rate by 0.1258395. This finding also empirically confirms that from several earlier works, for example, (Levy (1988); Gounder (2001); Hansen & Tarp (2001); McGillivray (2006); Loxley & Sackey (2008); Gomanee, Girma, and Morrissay (2005); Nilsson (2013); Karras (2006); Tra (2014); Asteriou (2009); (Fasanya & Onakoya (2012); Islam (1972)).

Another control variable is population, which has a positive, and significant ($p < 0.01$) consequence on GDP, indicating a 1 percent gain in population will upsurge GDP by 1.641085. And gross capital formation, which has a positive, and significant ($p < 0.01$) consequence on GDP, indicating a 1 percent gain in capital formation will upsurge GDP by 0.1159144.

Population is a significant factor explaining economic growth in selected Sub Sahara nations. The coefficient of population is bigger than that of foreign aid, suggesting that increased population can bring desired results in these sampled countries. Population increases active labor forces and thereby imposes a positive impact on economic growth.

Although the R^2 in the first model was relatively low, the more variables are added to the regression the higher the R^2 becomes. R^2 measures the goodness of fit in the regression; this category of measurement is reliable due to the fact that the R^2 will only increase if the improvement of adding a variable in the regression compensates the reduction of degrees of freedom (Studenmund 2011, 52-54). The sixth and final model, which shows all five independent variables correlation towards economic growth, has a relatively low R^2. Evan though the R^2 has a relatively low value the p-value (=0.000) is significant, which refers to the regression being a generally good fit.

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 conclusions

To understand the impact of foreign aid on economic growth in the Sub-Saharan African region, this study makes use of a sample of ten countries over a period of 27 years from 1993 to 2019. These countries were chosen on the basis that sub regions (4 countries from each sub regions) and they are the largest recipients of aid in Sub-Saharan Africa namely: Dem Rep of Congo, Cameroon, Central African Rep, Chad, Kenya, Tanzania, Uganda, Mozambique, Nigeria, Mali, Niger and Senegal.

This study investigated the link between foreign aid and economic growth. As a first step, it has overviewed the relationship between foreign aid and economic growth. It has been developed an econometric model through which it has been made a statistical test of one model equations. After that, it has been applied regression analysis for model equation between various variables.

The insignificant variables in the regression are Gross Domestic Savings as a percentage of GDP and export of goods and services as a percentage of GDP. The effect of foreign aid (Net official development assistance and official aid received as a percentage of GDP), population growth and capital formations are statistically significant on real GDP growth rate. And gross domestic savings and export of goods and services are statistically insignificant.

This result is consistent with other works of Levy (1988); Gounder (2001); Hansen & Tarp (2001); McGillivray (2006); Loxley & Sackey (2008); Gomanee, Girma, and Morrissay (2005); Nilsson (2013); Karras (2006); Tra (2014); Asteriou (2009); (Fasanya & Onakoya (2012) and Islam (1972). Therefore, foreign aid support and accelerate the overall economic growth of developing countries with addition to other important factors domestic capital formation and population.

5.2 Recommendations

Based on the findings of our thesis, the following recommendations and policy implication are given, to enhance economic growth, one of the most important things that the government of foreign aid recipient countries should do is to provide good monetary policy environment where the impact of foreign aid will be well achieved. Since the obvious fact & realities of developing countries are known the rate of economic growth and aid effectiveness, the governments should take serious measures on main determinant factors of economic growth like population and capital formations. Moreover, in order to enhance the effectiveness of foreign aid the government should have to play its role in attaining good level of democracy particularly in agricultural based economies.

We also recommended the donor governments that in addition to helping developing countries by granting foreign aid, emphasis should be put also on encouraging the recipient countries governments on how to strengthen more domestic capital formation, population policy, good monetary policy and governance.

In order to accelerate sustainable economic growth for economic development developing countries should do:-

1) Develop and increase multi foreign aid assistances especially on infrastructures, investment & capital formation.
2) Develop more effective & efficient rules, regulations, policies, regulating and controlling mechanisms for foreign aid assistances
3) Strengthen the present, and potential future regulatory structure and institutions of capital formation
4) Improve the capital market conditions and existing institutional framework for capital in and out flows with addition to domestic capital formation
5) Strengthen the government's ability to insure quality of governance
6) Develop strategic population policy
7) Promote and support more domestic investments through effective economic policies, programs and strategies.

As regards to the role of financial depth, one should be cautious in drawing out policy implications, sectoral foreign aid, conditional and unconditional foreign aid, political systems & foreign

aid effectiveness issues needs further deep, detail and multidimensional perspectives for further research works in the future. Especially why – for whom foreign aid need, comparison between aid recipient and not, expectations of foreign aid & its out come through political economic framework.

APPENDIX 1: list of selected sub – Sahara African countries

Number	Regions	Countries	Remarks
1.	Western Africa	Nigeria	
		Mali	
		Niger	
		Senegal	
2.	Central Africa	Dem Rep of Congo	
		Cameroon	
		Central African Rep	
		Chad	
3.	Eastern Africa:	Ethiopia	Excluded because of inconsistency & unbalanced data
		Kenya	
		Tanzania	
		Uganda	
4.	Southern Africa:	Mozambique	
		Malawi	Excluded because of inconsistency & unbalanced data
		Zambia	Excluded because of inconsistency & unbalanced data
		Zimbabwe	Excluded because of inconsistency & unbalanced data
Total	**4 regions**	**12 countries**	**4 countries excluded on the process**

Appendix 2 - Variables Explanations and Data Sources

MODELS	Dependent and independent Variables	Variable explanations	Remark	Sources of data
Model 1	Gross domestic product (GDP);	Gross domestic product (GDP) from the expenditure side is made up of household final consumption expenditure, general government final consumption	GDP (current US$)	**World Development Indicators**
	foreign aid	Net official development assistance is disbursement flows (net of repayment of principal) that meet the DAC definition of ODA and are made to countries and territories on the DAC list of aid recipients. Net official aid refers to aid flows (net of repayments) from official donors to countries and territories in part II of the DAC list of recipients: more advanced countries of Central and Eastern Europe, the countries of the former Soviet Union, and certain advanced developing countries and territories. Official aid is provided under terms and conditions similar to those for ODA. Part II of the DAC List was abolished in 2005. The collection of data on official aid and other resource flows to Part II countries ended with 2004 data. Data are in constant 2018 U.S. dollars.	Net official development assistance and official aid received (constant 2018 US$) [DT.ODA.ALLD.KD]	**World Development Indicators**
	Gross domestic savings	Gross domestic savings are calculated as GDP less final consumption expenditure (total consumption).	Gross domestic savings (% of GDP)	**World Development Indicators**
	Population, total	Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship. The values shown are midyear estimates.	Population, total	**World Development Indicators**

	Gross fixed capital formation;	Gross fixed capital formation (formerly gross domestic fixed investment) includes land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. According to the 1993 SNA, net acquisitions of valuables are also considered capital formation.	Gross fixed capital formation (% of GDP)	**World Development Indicators**
	Exports of goods and services (% of GDP)	Exports of goods and services represent the value of all goods and other market services provided to the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services. They exclude compensation of employees and investment income (formerly called factor services) and transfer payments.	Exports of goods and services (% of GDP)	**World Development Indicators**

Source; World Development Indicator, 2022

Appendix 3 – Model I Descriptive Statistics results

```
. summarize gdp foreiaid gds expgs pop gfcap
```

Variable	Obs	Mean	Std. Dev.	Min	Max
gdp	324	3.41e+07	8.17e+07	851174.4	5.47e+08
foreiaid	324	1129044	1097887	51500	1.14e+07
gds	324	7173276	1.95e+07	-62103.1	1.51e+08
expgs	324	7023607	1.69e+07	158252.3	1.44e+08
pop	324	34081.39	38493.41	3046.148	200963.6
gfcap	324	20.28984	7.873888	2.1	59.72307

Appendix 4 – Model I balanced & time variable results

```
. xtset countrycode year
       panel variable:  countrycode (strongly balanced)
        time variable:  year, 1993 to 2019
                delta:  1 unit
```

Appendix 5 – Model I fixed – effects regression results

```
. xtreg lngdp lngds lngfcap lnexp lnpop lnforeiaid, fe

Fixed-effects (within) regression               Number of obs      =       323
Group variable: countrycode                     Number of groups   =        12

R-sq:  within  = 0.1011                         Obs per group: min =        26
       between = 0.4254                                        avg =      26.9
       overall = 0.1307                                        max =        27

                                                F(5,306)           =      6.88
corr(u_i, Xb)  = -0.2233                        Prob > F           =    0.0000

------------------------------------------------------------------------------
       lngdp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       lngds |   .0421709   .0405411     1.04   0.299    -.0376037    .1219455
     lngfcap |   .1005672   .0388065     2.59   0.010     .0242058    .1769285
       lnexp |   .0751646   .0434357     1.73   0.085    -.0103059    .1606351
       lnpop |   2.209033   .7320189     3.02   0.003     .7686056    3.649461
  lnforeiaid |   .1058964   .0443086     2.39   0.017     .0187084    .1930845
       _cons |   28.22949   2.920166     9.67   0.000     22.48334    33.97564
-------------+----------------------------------------------------------------
     sigma_u |  1.2657866
     sigma_e |  4.3119253
         rho |  .07933758   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(11, 306) =     1.82                 Prob > F = 0.0505
```

Appendix 6 – Model I fixed – effects (robust) regression results

```
. xtreg lngdp lngds lngfcap lnexp lnpop lnforeiaid, fe vce(robust)

Fixed-effects (within) regression               Number of obs      =       323
Group variable: countrycode                     Number of groups   =        12

R-sq:  within  = 0.1011                         Obs per group: min =        26
       between = 0.4254                                        avg =      26.9
       overall = 0.1307                                        max =        27

                                                F(5,11)            =      2.12
corr(u_i, Xb)  = -0.2233                        Prob > F           =    0.1395

                               (Std. Err. adjusted for 12 clusters in countrycode)
------------------------------------------------------------------------------
             |               Robust
       lngdp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       lngds |   .0421709   .0660486     0.64   0.536    -.1032011    .1875429
     lngfcap |   .1005672   .0715287     1.41   0.187    -.0568664    .2580007
       lnexp |   .0751646   .0967839     0.78   0.454    -.1378554    .2881846
       lnpop |   2.209033   .9770535     2.26   0.045     .0585532    4.359514
  lnforeiaid |   .1058964   .0435184     2.43   0.033     .0101131    .2016798
       _cons |   28.22949   5.113574     5.52   0.000     16.97459    39.48439
-------------+----------------------------------------------------------------
     sigma_u |  1.2657866
     sigma_e |  4.3119253
         rho |  .07933758   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Appendix 7 – Model I Random – effects regression results

```
. xtreg lngdp lngds lngfcap lnexp lnpop lnforeiaid, re

Random-effects GLS regression                   Number of obs      =       323
Group variable: countrycode                     Number of groups   =        12

R-sq:  within  = 0.0972                         Obs per group: min =        26
       between = 0.5230                                        avg =      26.9
       overall = 0.1406                                        max =        27

Random effects u_i ~ Gaussian                   Wald chi2(5)       =     44.11
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
```

lngdp	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lngds	.0451246	.0345075	1.31	0.191	-.0225088	.1127581
lngfcap	.1159144	.0370158	3.13	0.002	.0433647	.1884641
lnexp	.052975	.0363494	1.46	0.145	-.0182686	.1242186
lnpop	1.641085	.519231	3.16	0.002	.6234112	2.658759
lnforeiaid	.1258395	.0403966	3.12	0.002	.0466636	.2050154
_cons	29.67293	2.31514	12.82	0.000	25.13534	34.21052
sigma_u	.7611607					
sigma_e	4.3119253					
rho	.03021926	(fraction of variance due to u_i)				

Appendix 8 – Model I Hausman specification test

```
. hausman fix .
```

	Coefficients (b) fix	(B) ran	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
lngds	.0421709	.0451246	-.0029537	.0212794
lngfcap	.1005672	.1159144	-.0153472	.0116522
lnexp	.0751646	.052975	.0221896	.0237777
lnpop	2.209033	1.641085	.5679482	.515995
lnforeiaid	.1058964	.1258395	-.0199431	.0182034

```
                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(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                      =        5.85
            Prob>chi2 =      0.3212
```

Appendix 9 – Model I Breusch and Pagan Lagrangian Multiplier test

```
. . xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        lngdp[countrycode,t] = Xb + u[countrycode] + e[countrycode,t]

        Estimated results:
                     |       Var     sd = sqrt(Var)
             ---------+------------------------------
               lngdp |   21.93845        4.68385
                   e |    18.5927       4.311925
                   u |   .5793656       .7611607

        Test:   Var(u) = 0
                            chi2(1) =     1.04
                         Prob > chi2 =     0.1544
```

Appendix 10 – correlation test

```
. mvtest correlations lngdp lngds lngfcap lnexp lnpop lnforeiaid

Test that correlation matrix is compound symmetric (all correlations equal)

      Lawley chi2(14) =    264.57
         Prob > chi2 =    0.0000
```

Appendix 11 – multivariate normality test

```
. mvtest normality lngdp lngds lngfcap lnexp lnpop lnforeiaid

Test for multivariate normality

    Doornik-Hansen              chi2(12) = 1347.925    Prob>chi2 =  0.0000
```

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