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THE RELATIONSHIP BETWEEN PUBLIC EXTERNAL DEBT AND ECONOMIC GROWTH IN ETHIOPIA: EVIDENCE FROM ARDL APPROACH TO CO-INTEGRATION

BY

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The Relationship between Public External Debt and Economic Growth in Ethiopia: Evidence from ARDL Approach to Co-integration

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This is to certify that the thesis prepared by Garedew Aweke, entitled: The Relationship between Public External Debt and Economic Growth in Ethiopia; Evidence From ARDL Approach to Co-integration and submitted in partial fulfillment of the requirements for the degree of Master of Science in International economics complies with the regulations of the University and meets the accepted standards with respect to its originality, quality and contribution.

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Abstract

This study is an effort to determine the effect of public external debt on economic growth in Ethiopia. Specifically, the study tries to answer the questions whether stock of public external debt and public external debt servicing has any significance effect on economic growth of the country and it also determined the magnitude of the effect. In doing this, the study used an Auto Regressive Distributive Lag model (ARDL modeling) to analyze Ethiopian data from 1981 to 2014 with GDP per capita as a function of stock of public external debt, public external debt servicing, human capital, physical capital, labor force, trade openness and policy change dummy. The empirical result reveals that in the long-run high level of stock of public external debt has a significant negative effect on economic growth and it poses great challenges on the economy. Therefore there is an evidence for the "Debt overhang" and "Conventional view" of public debt in Ethiopia. On the other hand public external debt servicing has a negative coefficient but insignificant in affecting economic growth and there is no evidence for the "Crowding out" effect in the country. In the long-run result, human capital is also found to have negative impact on GDP per capita. Moreover, Labor force has a significant positive impact but private capital formation and trade openness are insignificant in explaining the Ethiopian economy. Hence, this study recommended the government of Ethiopia and local policy makers to improve the existing policies on public external debt management such as to invest in productive activities and sectors, to implement structural change, public sector reform and tax reform, should try to minimize the dependence on external borrowing through diversifying the economy so as to generate more revenue in the domestic.

Key phrases: Public external debt, Public external debt servicing, ARDL and economic growth.

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Acronyms

ADF African Development Fund

ADB African Development Bank

AIC Akaike Information Criteria

AR Autoregressive

ARDL Autoregressive Distributive Lag

DF Dickey Fuller

DW Durban Watson

ECM Error Correction Model

ECT Error Correction Term

EPRDF Ethiopian People Revolutionary Democratic Front

EU European Union

FDI Foreign Direct Investment

GDP Gross Domestic Product

GDPpc Gross Domestic Product Per Capita

GMM Generalized Method of Moment

HIPC Highly Indebted Poor Countries

HK Human Capital

IDA International Development Association

IMF International Monetary Fund

K Capital Formation

LFP	Labor Force as a share of Population
MDRI	Multi-lateral Debt Relief Initiative
MoFED	Ministry of Finance and economic Development
NBE	National Bank of Ethiopia
OLS	Ordinary List Square
PED	Public External Debt
PEDs	Public External Debt Servicing
PP	Phillips Perron
SSA	Sub-Saharan Africa
TOP	Trade Openness
UNCTAD	United Nation Conference on Trade and Development
US	United States
USD	United States Dollar
VAR	Vector Autoregressive
WB	World Bank

CHAPTER ONE

1. Introduction

1.1. Background of the study

External borrowing is considered as a common phenomenon for all developing countries in their early stages of development, as they are often faced with limited domestic resources for development and growth, and can therefore borrow from developed nations and lender institutions to bridge the domestic resource gap. However, external borrowing requires fixed payments including interest attached independent of the actual return on the invested funds. If a country either invests the money inefficiently or is subject to unexpected difficulties, it may not be able to meet contracted service payments. Potential debt servicing problems have existed for many years, and recently, the actual occurrence of service interruptions have become more frequent for developing countries (Abuzaid, 2011).

Governments of emerging economies often borrow to complement the fiscal gap between proposed expenditure and expected revenue as most developing countries usually have limited financial resources to finance their annual budgets (Carroll, 2013). Consequently, developing countries government have accumulated huge public external debts over the years since they have low per capita income, inadequate saving, low tax base and incompetent tax collection system. According to World Bank (2014) it is important to consider for developing countries including Ethiopia that most of the external debt of these countries is foreign currency

denominated and causes the 'Original sin[1]' in the international market. Then a fluctuation in real exchange rate of these developing countries not only increases the debt ratios, but also it affects the interest rate that the country can negotiate on international markets and economic growth which can also affect the sustainable fiscal path (Martinez et.al, 2009).

Although the country Ethiopia has different sources of finance for economic growth, the dependence on external debt has been increasing over time. This implies that the domestic financial resources are not sufficient to finance its development schemes and foster economic growth. But almost all the external debt is an accumulation of annual loans between the Ethiopian government and creditor nations and lending institutions. The latter includes multilateral financial institutions and private lenders. Of the total stock of external debt the significant share is handled by public and publicly guaranteed external debt (World Bank, 2015).

In line with this, according to the World Bank classification of Highly Indebted Economies, the country is one of the severely indebted low-income countries. Ethiopia's public external debt has changed significantly in magnitude and composition over the last three decades. In 1981, it stood at about US$ 1.6 Billion which is equivalent to 22.4% of GDP, and US$ 9.8 Billion (127.7% of GDP) in 1995. Following the debt relief granted to benefit the Heavily Indebted Poor Countries (HIPCs) in 2008, it declined to US$ 2.9 Billion (10.45% of GDP) and in 2014 this figure increased to US$ 15.9 Billion (28.5% of GDP). This indicates that the country is one of highly indebted poor country in the world as public external debt is increasing from time to time (World Bank, 2015).

[1] *The original sin implies when the borrower countries borrow money from the international market and obliged to pay this debt in terms of foreign currency or a situation where countries could not borrow and make payments in terms of their own domestic currency (Obstfeld and Taylor, 2004).*

1.2. Statement of the Problem

The analysis of total external debt can be divided in two sub categories that are public external debt[2] and private external debt[3]. Both types of external debts have their own side effects on the economy (Cecchetti et al., 2011). Therefore in order to determine debt effect on economic growth, the channels through which the economy is affected, have to be specified. That is the total external debt should be decomposed to private external debt and public external debt in order to analyze their effect on the output level. This separation of debt will bring the real effects of debt level on the economy and it will also identify the channels through which debt can affect the economy (Vosyliute, 2014).

There are some studies conducted in the past mainly on the relationship between external debt and economic growth in Ethiopia. But the existing studies lack the following respects. *First*, the existing studies which present the impact of external debt on economic growth in the country did not distinguish between public external debt and private external debt. But this is crucial given that the transmission channels are substantially different and there should be separation between public external debt and private external debt. That is there is less evidence on the specific channels through which external debt affects growth. *Second,* most of the previous studies did not separate the debt burden into total external debt stock and total external debt servicing. In this paper, the effect of public external debt is separated into total stock of public external debt

[2] *As Schclarek (2004) Public external debt comprises long-term external obligations of public debtors, including the national government, political subdivisions or an agency of either, and autonomous public bodies.*

[3] *Private external debt is Private nonguaranteed external debt comprises long-term external obligations of private debtors that are not guaranteed for repayment by a public entity.*

effect and repayment or servicing of public external debt effect. In addition, the causal relationship of these variables with economic growth is examined.

Another problem with previous studies is that most of them are used Johanson co-integration method of vector autoregressive method as their method of analysis. Even though the Johnson's Co-integration technique is one of the widely used methods of time series analysis, its outcome could not be reliable for small sample size; that is observations less than eighty years for the time series data (Narayan, 2005; Udoh et.al, 2012). Relatively, the Autoregressive distributed lag (ARDL) method has some advantage over the Johnsons method (Pesaran et al., 1999). These advantages are it can be applied irrespective of whether the regressors are I(1) and I(0). It can also provide valid and statistically significant result or avoids the problem of biasness in small sample sizes (Pesaran et al., 1999, Narayan, 2005; Chaudhry et.al, 2006 and Udoh et.al, 2012). This ARDL procedure can provide unbiased and valid estimates of the long run model even when some of the regressors are endogenous (Harris et.al, 2003, Pesaran et.al, 1999, Ang, 2007). Furthermore, in using this Approach, a dummy variable can be included in the co-integration test process, which is not permitted in Johansen's method (Rahimi et.al, 2011). Hence in this paper, ARDL model is used to provide valid empirical evidence on the main target of this study which is assessing the impact of public external debt on economic growth in Ethiopia.

1.3. Objectives of the study

The general objective of this study is to examine the relationship between public external debt and economic growth in Ethiopia. Under the umbrella of this general objective the study have the following specific objectives:

1. To investigate the effect of public external debt (both its stock and its servicing) on the aggregate economic growth of Ethiopia in the short run and in the long run,
2. To analyze the trends, magnitudes and structure of debt profile of the country and performance of the Ethiopian economy,
3. To show the causal relationship between public external debt and economic growth in the country and
4. To provide possible recommendations.

1.4. Research questions

The study under investigation addresses the following questions.

- How and in what degree the stock and servicing of public external debt affect economic growth of Ethiopia?
- What is the role of public external debt in determination of economic growth relative to other determinants and whether the effect is the debt overhang or the debt crowding out or both?
- Is there a causal relationship between public external debt and economic growth in Ethiopia?

1.5. Scope and limitations of the study

The study limited itself only with the relationship between public external debt and economic growth in Ethiopia which covers the annual data for all respective economic variables for 34 years from the period 1981 up to 2014. During the overall investigation of this study, the main limitation was associated with data availability in some variables. There are shortages of

disaggregated data particularly, on portion of public external borrowing that used for social consumption and portion of public external debt that have been changed to public capital.

1.6. Significance of the study

After it is completed this study is to be significant in the following aspects. Firstly, it improved the practical knowledge and skill of the researcher of this study by making familiar with factual evidence on the study topic and related macroeconomic issues. Secondly, it produce general information on the relationship between Public external debt and economic growth. Thirdly, it will serve as a base ground and reference for further studies on Public external debt and economic growth. At last but not least it generates evidences for policy implications and recommendations that aim to analyze the interaction of public external debt and economic growth.

1.7. Organization of the study

The study is organized of six chapters. The first chapter deals with the introduction parts including background of the study, Statement of the problem, Objectives of the study, Basic research questions, Significance of the study, Scope and limitations of the study. The second chapter discussed both the theoretical and empirical literature review. In the third chapter the overview of debt profile and performances of Ethiopian economy is briefly discussed. Chapter four clarified the methodology of the study and model specification. Under chapter five, the collected data is estimated and the results are intensively discussed. Under the last chapter which is chapter six the conclusions and policy recommendations are presented.

CHAPTER TWO

2. Literature Review

2.1. Theoretical Literature Review

2.1.1. The Neo Classical and Endogenous Theories of Economic Growth

In the 1960s, economic growth theory was explained by the neoclassical theory developed mainly by Ramsey (1928), Solow (1956), Swan (1956), Cass (1965), and Koopmans (1965). The neoclassical growth theory helps to analyze the differences in living standards among countries. Countries with low GDP per capita level grow faster and reach the growth level of rich countries, while the growth of rich countries is slower. This property of faster growth of poor countries, in which the starting point of their GDP per capita is lower than the rich countries, is called the theory of convergence (Barro, 1996).

The application of convergence property is based on the analysis of reasons for the differences between countries. If two countries have the same steady state, but the deviation from this state is different, then the poor country will grow faster and will reach the rich country. The historical reasons such as wars can be a reason for a different starting point. However, the convergence property cannot be applied if the steady state of two countries differs with each other. This can be caused by the differences in saving ratio, fertility, working conditions, technological abilities or even government policies. In such cases, each of the country will reach its own steady state level and the conditional convergence theory cannot hold true (Mankiw, 2002).

The convergence property is derived from diminishing returns to capital. Different researches use a broad concept of capital from physical goods to variables representing human capital. Economic growth will be faster if human to capital ratio is higher. Based on the historical

evidence, wars destroy physical capital; however, human capital allows recreating the losses quite fast due to the combination of existing human capital and foreign technologies. In order to increase human capital, additional education or experience is necessary, thus it takes longer time than improvements in physical capital. The neoclassical model clarifies that the economic growth stops without advancements in the technologies (Barro, 1996).

The explanation of the technological progress is represented in endogenous growth theory. This theory rejects the assumption of the technological progress as exogenous variable and includes the new ideas in the definition of the technological improvements (Mankiw, 2002). The broader definition of the variable leads to the growing returns to scale, but the evaluation of new ideas becomes difficult and imperfect competition can occur. Thus, later the model assumed that new ideas could spread over society due to its properties of non rival and non-excludable goods. However, Romer (1986) emphasized that the developments would spread among particular part of society and the problem of imperfect competition would arise. Later, Barro and Sala-i-Martin (1995) supplemented this model and they claimed that if the new ideas keep being created, economic growth would be positive in the long-run. However, there are factors, which might influence the process of creation of new ideas and shift the economic growth out of the Pareto optimal point.

These factors are government actions such as provision of infrastructure services, protection of intellectual property rights, and regulations of international trade, financial markets (Barro, 1996). However, the convergence property disappears in this model. Barro and Sala-i-Martin (1995) brought this property to the theory based on the assumption that the technological advances from the leading economies can be implemented in the developing countries and it is

cheaper and faster to implement something, what already exists, comparing to the creation of new technologies.

Recent work on endogenous growth theory has sought to supply the missing explanation of long run growth. This approach provides a theory of technical progress, one of the central missing elements of the neoclassical model. For a given technology or state of knowledge it is reasonable to assume constant returns to scale in the standard, rival factors of production, such as raw labor, broad capital, and land. But then, the returns to scale tend to be increasing if the non-rival ideas are included as factors of production. These increasing returns conflict with perfect competition. Moreover, the compensation of old ideas in accordance with their zero current marginal cost of production will not provide the appropriate reward for the research effort that underlies the creation of new ideas. Thus endogenous growth theory explains economic growth in the long run through creation of new ideas and production methods (Barro, 1996).

2.1.2. Definitions and Thoughts of Public External Debt

External debt by definition represents money borrowed by a country or a government from foreign lenders with a liability to pay back the debt plus interest attached on the debt in a currency in which the loan was made. Country which borrowed money may have to export its goods and resources to the lender country or to the international market, to earn that borrowed foreign currency and to pay back (Panizza, 2008). External debt presents the outstanding amount of its actual or current liabilities that require a certain payment of principal plus some interest attached to it in future. It includes debt securities, bonds, notes, money market instruments, loans, deposits and currency (Dias, 2010).

The external debt is often used as a source of finance, giving a new access to resources. It is important in such a way that the attitude of countries towards government's development strategy and its relation to trade policy and capabilities that external debt could be beneficial and not as a burden. The external debt gives ability to use internal debt for other purposes if needed. It allows various entities to finance growth opportunities that it would not be able to do that with their own funds and resources; it plays a role for financing investments and imports, enabling the developing country to reach economic growth and increase its consumption. However, the other side of the external funding sometimes leads to loosing ownership, come of a required return on investment like interest on lend money (Pradhan, 2009).

Total external debt consists of private and public external debt. Short-term debt includes all debt having an original maturity of one year or less and interest in arrears on long-term debt. Public external debt comprises long-term external obligations of public debtors, including the national government, political subdivisions or an agency of either, and autonomous public bodies, and external obligations of private debtors that are guaranteed for repayment by a public entity. Private external debt is private nonguaranteed external debt comprises long-term external obligations of private debtors that are not guaranteed for repayment by a public entity (Schclarek, 2004).

Based on this perspective, it is important to understand the differences between public external debt and private external debt and how they affect economic growth. According to the Elmendorf and Mankiw (1999), public external debt can be analyzed through the conventional view perspective or Ricardian equivalence theory. The Ricardian approach emphasizes the irrelevance of the debt, while the conventional view highlights the aggregate demand in the short

time period, while the effect of crowding out in the long run.

2.1.2.1. The Conventional View

According to Elmendorf and Mankiw (1999) government debt analysis, the view is based on the assumption that the tax reduction is equal to the increase in debt level. In the short-run, lower taxes can cause the increase in households' disposable income and aggregate demand, which in turn increases the national income. Keeping both prices and wages constant, higher demand affects the production level. Thus government will make a correction which is caused due to the debt increase by the tax cut or government expenditure growth.

Starting from the Keynesian national income equation, the definition of the current account is based on the sum of net exports and investment. The current account is positive when the country becomes a net lender to the other economies and the negative current account is indicated when the country becomes a borrower from the international market. In more details, negative current account represents domestic investment undertaken by foreign residents (NFI) (Elmendorf & Mankiw, 1999). Thus, under the assumption of net foreign investment is equal with the net export of a particular nation, the sum of private saving plus government saving is equal with investment in domestic or foreign country.

If the government decides to reduce taxes, it can affect private savings. In order to keep the balance, the private savings should increase by the exact amount of a decrease in public savings and this assumption is based on Ricardian equivalence theory. However the conventional view claims that private savings increase less comparing to the decrease of public savings which is tax minus government expenditure and the difference leads to the fall in national savings. If the sum

of private saving and public saving is low, then according to the equality assumption and to keep the balance the sum of domestic investment plus net foreign investment should follow it or reduce. The decline in investment affects the domestic capital stock negatively and the lower capital stock reduces the production level and the national income. In addition to this, the marginal product of capital will increase as well as the interest rates and returns per capital. On the other hand, the decreasing labor productivity reduces wages and it means that total income of the household will be lower. Furthermore, the equality between net foreign investment and net exports indicates that the changes in net foreign investment are the same as changes in the net exports (Elmendorf & Mankiw, 1999). Thus the lower net foreign investments means that trade deficit is growing and it will lead to an economic crisis known as twin deficits[4] (Mankiw, 2002).

Furthermore, high government debt can cause difficulties to borrow more money in order to cover increasing deficit. When it is difficult to borrow money from the international lender countries and institutions government can decide to increase revenues by using seigniorage. Seigniorage means that monetary authorities issue more money and increase inflation which can lead to hyperinflation. Likewise, the higher level of government debt requires increasing taxes and this higher level tax will lead to Dead Weight Loss. Thus another problem will be present due to this tax increase. The high public external debt level can make country more vulnerable to the financial crisis in the international market and it can lead to defaulting[5]. Then it can form the poor image and low reliability of the country by the lender countries and institutions (Elmendorf & Mankiw, 1999).

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[4] *According to Mankiw (2002) the term twin deficit means the deficit in both the government budget and trade balance at the same time.*

[5] *Defaulting is the inability of a borrower government or country to payback the debt that it has borrowed from the international market or lack commitment to honor the debt obligations (Aguiar and Gopinath, 2004).*

2.1.2.2. The Recardian Equivalence Theory

The main idea of Ricardian equivalence theory is that the level of government external debt is not important and it does not have any effect on the economy. This theory clarifies that it does not affect consumption, capital or even economic growth; if government reduces taxes now, society should know that taxes would be increased in the future. Thus citizens would not consume more but they would be saving more in order to pay the future tax and the budget deficit will coincide with an increase in private saving (Elmendorf & Mankiw, 1999). This idea can be summarized as the combination of government budget constraint and the permanent income hypothesis. The government budget constraint explains that lower taxes today mean higher taxes tomorrow keeping stable level of government spending. The permanent income hypothesis claims that consumers make their decisions on their income evaluated in the long run. They calculate the present value of their cash flows. The same approach can be explained by government bonds and securities. Barro (1974) said that if citizens buy bonds, then they can earn some income based on the interest. However, the interest is paid by the government which collects their revenues through taxes paid by the same citizens. In the end the additional wealth or marginal change is equal to zero.

However, there are some critics about Ricardian equivalence theory. First of all, the theory was criticized due to the overlapping generations. When government is dealing with the debt today people know that taxes will be higher in the future. However, this theory does not specify the time in the future. The higher taxes can be transferred for the generation which is not even born yet. Barro (1974) disagrees with this opinion and explains that not only altruistic people will care about next generations, but also their own consumption as well as the consumption of future

generations. This can be explained by the inter-temporal consumption formula as:

$$U_t = U(C_t) + \beta U(C_{t+1}) + \beta^2 U(C_{t+2}) + \beta^3 U(C_{t+3}) + \cdots + \beta^n U(C_{t+n})$$

U_t , is the inter-temporal utility, C_t is consumption at time t and β is the discounting factor. Although Ricardian equivalence theory has its own critics, there is one more argument why government debt does not matter for the aggregate variables. Lower taxes encourage consumption, crowed out the capital and residents will respond by increasing saving, capital stock and real interest rate return to their former level (Elmendorf &Mankiw, 1999). Thus it explains the economic behavior better in the long-run rather than short run. However, this argument was criticized by Poterba and Summers (1987), who claimed that there is a possibility that government reduces taxes, issues bonds and after certain period increases taxes on the interest payments. Thus, the government debt can be almost repaid by the same generation, if taxes would be high enough. In this case, Ricardian equivalence theory does not provide a valid explanation for the short term period.

Furthermore, the question arises if growth of government debt can be infinite over the periods. When government reduce the tax level and issues bonds, then after some time period government can issue new bonds in order to repay the interest to the past buyers of the bonds. This example is similar to well known Ponzi scheme[6] in the international finance, when new instruments are issued to cover the liabilities for the previous investors. In the case of growth of government debt, it is important to know at which rates the interest rate of government debt and the market are growing. If the interest rate of government debt is growing faster than the growth of economy, then the debt will continue to increase and it will be difficult to find new buyers for the bonds (Elmendorf & Mankiw, 1999). Tirole (1985) claim that it is possible to apply Ponzi

[6] *Ponzi scheme can be happened in infinite time trend of a government debt and it is when government borrows new money today in order to repay the debt and interest attached of its past debts in the international market.*

scheme for government and it can be beneficial due to the reduced possibility of over-saving. Thus Ricardian theory does not consider the possibility of permanent postponement of tax growth and increasing government debt. Furthermore, the Ricardian theory does not evaluate the effect of myopia or inability of the people in the long foresight for the future period. People usually are not foresight and do not think about the tax rates in the future. Thus the myopia can lead to pure evaluation of consumers' ability and the necessity to save.

Although there are different arguments on this theory, there are also reasons why it is important to describe this Recardian equivalence theory. Firstly, this theory contradicts with the majority of the economist views and it leads to further discussion and debates about the macroeconomic phenomena, specially on the economic effects government debt and the channels through which it can affect the economy which is difficult to justify. Furthermore, according to Elmendorf & Mankiw (1999), this theory can be also understood as the theoretical benchmark, which can be used for the analysis of government debt in the economy.

Generally if the Ricardian Equivalence theory does not hold and that public debt can affect real variables, then according to the conventional view of public debt in the short run output is demand determined and fiscal deficits or higher public debts have a positive effect on disposable income, aggregate demand, and overall output. This positive short run effect of budget deficits and higher debt is likely to be large when the output is far from capacity. According to Elmendorf & Mankiw, (1999), things are different in the long-run. If Ricardian Equivalence does not hold, the decrease in public savings brought about by a higher budget deficit will not be fully compensated by an increase in private savings. As a consequence, national savings will decrease, resulting in lower total investment, either at home or abroad. Lower investment at home will have a negative effect on GDP since it will lead to a smaller capital stock, higher interest rate,

lower labor productivity and wages. Lower foreign investment or higher foreign inflows instead, will have a negative effect on foreign capital income and will thus lower the country's future GNP. This negative effect of an increase in public debt on future GDP or GNP can be amplified by the presence of distortionary taxes.

2.1.2.3. The Non Linear (Inverted "U") Relationship of public external Debt and Economic Growth

Theory suggests that "reasonable" levels of borrowing by a developing country are likely to enhance its economic growth, both through capital accumulation and productivity growth. It suggests that foreign borrowing has a positive impact on investment and growth up to a certain point or threshold level and beyond this level it affects growth negatively. Countries at early stages of development have small stocks of capital and are likely to have investment opportunities with rates of return higher than in advanced economies. As long as they use the borrowed funds for productive investment and they do not suffer from macroeconomic instability, policies that distort economic incentives, or sizable adverse shocks, growth should increase and allow for timely debt repayments (Pattillo et al., 2004).

But why would large levels of accumulated debt lead to lower growth, and through which channels is this likely to occur? According to Krugman (1988) and Sachs (1989), the most well known explanation comes from "debt overhang" theory, which shows that if there is some likelihood that in the future debt will be larger than the country's repayment ability; expected debt-service costs will discourage further domestic and foreign investment. Potential investors will fear that the more is produced, the more will be "taxed" by creditors to service the external debt, and thus they will be less willing to incur investment costs today for the sake of increased

output in the future. This non- linear relationship argument is represented in the "debt Laffer curve"[7], which posits that larger debt stocks tend to be associated with lower probabilities of debt repayment. The "good" section of the curve implies that, increases in the face value of debt are associated with increases in expected debt burden, while increases in debt reduce expected debt repayment on the "bad" section of the curve. The expectation that some portion of the debt will have to be forgiven can also at some point discourage private foreign investors from providing new financing, thus lowering capital accumulation (Krugman, 1988 and Sachs, 1989).

Economic growth is positively related to the level of external debt in the "good" (growth augmenting section) or below the threshold level. Another part is where economic growth is negatively related with debt accumulation i.e. growth hindering section. The threshold level indicates the optimum level of external debt where the rate of economic growth will be maximized. The favorable effect of external debt depends on the fraction of external debt that is used to enhance investment versus sustaining domestic consumption in the country.

2.1.3. The Channels through which Public Debt Affect Economic Growth

The channels through which public debt can potentially affect economic growth are diverse. An important channel through which public debt accumulation can affect growth is that of long-term interest rates. Higher long-term interest rates, resulting from more debt-financed government budget deficits, can crowd-out private investment, thus dampening potential output growth.

[7] *Debt Laffer curve is a curve which shows that as a country accumulates more debt, after a certain level there is a discrepancy between the face value of the debt and the secondary market price of that debt which indicates that there is inefficiency in the sense that the expected value of the repayments is lower than the actual face value of the claims against the country (Bachvarova, 2008).*

Indeed, if higher public financing needs push up sovereign debt yields, this may induce an increased net flow of funds out of the private sector into the public sector. This may lead to an increase in private interest rates and a decrease in private spending growth, both by households and firms. While the empirical findings on the relationship between public debt and long-term interest rates are diverse, a significant number of recent studies suggest that high debt and deficits may contribute to rising sovereign long-term interest rates and yield spreads (Elmendorf and Mankiw, 1999).

The effect of public debt on growth could occur through all the main sources of growth. Another channel through which public debt can affect the economic growth is the capital-accumulation channel which is supported in particular by two arguments. First, the debt-overhang concept implies that when external debt grows large, investors lower their expectations of returns in anticipation of higher and progressively more distortion on taxes needed to repay debt, so that new domestic and foreign investment is discouraged, which, in turn, slows capital-stock accumulation. The second argument also reaches similar conclusions by stressing that in heavily indebted countries, investors hold back, given the uncertainties about what portion of the debt will actually be serviced with the countries' own resources. Both arguments suggest that the effects of debt on growth are likely to occur through lower capital accumulation (Pattillo, et al 2004).

Other considerations imply that high public debt levels may also constrain growth by lowering total factor productivity growth. For example, governments may be less willing to undertake difficult and costly policy reforms if it is perceived that the future benefit in terms of higher output will accrue partly to foreign creditors. The poorer policy environment, in turn is likely to

affect the efficiency of investment and productivity. In addition, high levels of uncertainties and instabilities related to the debt overhang are likely to hinder incentives to improve technology or to use resources efficiently. For example, as in other high uncertainty environments, investment may be misallocated to activities with quick returns, rather than long-term, higher-risk irreversible investment which would be more conducive to long-run productivity growth. Misallocated resources and less efficient investment projects could thus contribute to slower productivity growth (Pattillo, et al 2004).

According to Krugman (1988), the external debt overhang affects economic growth through private investment, as both domestic and foreign investors are deterred from supplying further capital. Generally the channels through which government debt is found to have an impact on the economic growth rate are private saving, public investment, total factor productivity (TFP) and sovereign long-term nominal and real interest rates (Checherita et al., 2010).

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 this section, the available empirical literatures are discussed by classifying into two categories which are single country studies and cross country studies.

2.2.1. Single country studies

A study by Jonse (2002) investigated the impact of external debt on economic growth in Ethiopia and the result indicated that external debt affects investment positively and is statistically significant. Melese (2005) found that all debt burden indicators have a negative relationship with economic growth in Ethiopia by using a structural macroeconomic model. Hailemariam (2011) examined the impact of external debt on economic growth and private investment in Ethiopia using a co-integrated VAR model. The findings indicate the occurrence of long run relationship among the variables included in both growth and private investment models which showed that past debt accumulation has a negative relationship with economic growth.

Mulugeta (2014) also investigated the impact of external debt on economic growth in Ethiopia which covers the time series data for the period 1983/84 to 2012/13 by using the Johansen Maximum Likelihood approach of VAR model and he revealed that real GDP is influenced negatively by the past stock of external debt and debt servicing and, positively by the current external debt inflows. A study by Wosene (2014) indicated that the relationship between external debt and economic growth both in the short run and long run is significant with a negative sign and the debt servicing variable has insignificant effect on economic growth.

A study by Rahman (2012) examines the impact of federal government's debt on the level of economic growth in Malaysia using quarterly data from 2000 to 2011 and found that high public domestic debt does have negative impact on the level of economic growth in the long-run. However, the level of public external debt has no significant influence in changing the economic growth within the same time frame. From the short-run perspective, both domestic and external debts have no statistically significant impact on the level of economic growth. Peng Lee and

Ling Ng (2015) examine whether public debt contributed to the economic growth in Malaysia over the period 1991 to 2013. The result of their study is consistent with the existing literature indicating a negative association between public debt and economic growth which indicate that public debt over time has a negative impact on GDP. In addition, they found that external debt service[8] is a decreasing function of GDP.

Blake (2015) also investigated the impact of public debt on economic growth in Jamaica using quarterly data from 1990 to 2014. He employed an autoregressive distributed lag model (ARDL), which jointly captures both short-run and long-run effects. The results of his study indicate that the public debt has a non-linear impact on economic growth. Another study by Al-Zeaud (2014) investigated the effect of public debt on growth using the per capita income as an index for economic growth and examines the impact of public debt on the performance of the Jordanian economy using Ordinary Least Squares (OLS) regression method. The results show that population growth and public debt have played very crucial positive role towards economic growth in Jordan. In other words, it shows that public debt promotes per capita income of Jordan economy.

An empirical study by Atique and Malik (2012*)* done for Pakistan using Ordinary Least Square (OLS) approach found that an inverse relationship between external debt and economic growth and that external debt amount slows down economic growth more as compared to domestic debt amount. Another study in the same country by Umar (2014) assesses the impact of foreign debt on the economic performance of Pakistan using data from 1970 to 2014 and found that foreign debts has not improve the state of foreign direct investment in Pakistan and far from improving

[8] *Debt servicing in this paper context represents the payment of debt amortization (liquidation of the principal) and accumulated interest attached over time; it is a contractually fixed charge on domestic real income and savings.*

economic growth. Probably, investors feel that with the increase in the external borrowing, the problems of debt overhang and crowding out effect will emerge, resulting in the shrinkage of the government funds for the development of economic and social infrastructure.

A study by Shah and Pervin (2012), assess the effect of public external debt on economic growth in Bangladesh economy using time series data for the period 1974 to 2010. The result indicates a long run significant negative effect of external public debt servicing and positive effect of external public debt stock on GDP growth and in the short run, only external debt servicing has negative effect but the debt stock does not have any significant effect. Their investigation did not find any evidence of debt overhang provided that there is no significant adverse effect of debt stock on GDP growth. But crowding out effect is seen in their result which is originated from the fact that there is evidence of adverse effect of debt service payment on economic growth for the period under investigation in Bangladesh.

Okechukwu and Anele (2012) empirically have done the effects of public external debt on the economic growth of Nigeria by using multiple regression analysis. The result shows that there is a positive relationship between public external debt stock and GDP. If public external debts are managed in such a manner that they are invested in self liquidating developmental projects it is good for the Nigeria's economy. A study by Winifred (2014) also investigated the impact of external debt on economic growth in Nigeria using time series data on external debt stock and external debt service for the period 1980-2012 and found the external debt burden has insignificant relationship with economic growth. But, the causality test reveals a bi-directional causal relationship between public external debt stock and economic growth. Apere (2014) also examined the impact of public external debt on private investment in Nigeria over the same

period using an instrumental variable technique of estimation. External public debt has a non linear U-shaped impact on private investment and the study recommended that, for Nigeria to benefit from government external borrowings such funds should be large enough compared with the country's GDP and should be invested in productive ventures.

Tasos (2012) investigated the relationship between economic growth and government debt for one of the biggest economies in the world, China; using data covering the period 1984 to 2011 and the result revealed that there are structural breaks in the economy of China but no Granger causality between the variables. Another study by Korkmaz (2015) examines the relationship between external debt and economic growth based on the VAR method for the economy of Turkey for the 2003 to 2014 period. The result shows a unidirectional causal relationship from economic growth to external debt. A study by Kasidi and seid (2013) examined the impact of external debt on economic growth of Tanzania for the period of 1990 to 2010 using time series data, the results indicate there is significant impact of both the external debt stock and external debt servicing on GDP growth in the short run. Long run relationship of co-integration test shows that there is no long run relationship between external debt and GDP in Tanzania.

2.2.2. Cross country studies

There are also studies on this area which are investigated in cross country cases. A study by Dereje (2013) examined whether external debt affects economic growth of selected heavily indebted poor African countries through the debt overhang and debt crowding out effect. He carried out his study using panel data for eight heavily indebted poor African countries including Ethiopia from the period 1991 to 2010. The result shows that external debt affects economic growth by the debt crowding out effect rather than debt overhang. Another study by Siddique,

Selvanathan, and Selvanathan (2015) analyzed the extent to which the external debt burden impacts on a country's GDP using data from a 38 year panel dataset of 40 highly indebted poor countries (HIPCs) over the period 1970-2007 and they found that an inverse relationship between external debt burden and economic growth in the short-run as well as in the long-run, that is a reduction in external debt stock would have significantly increased the growth performance of the indebted nations.

Shabbir and Yasin (2015) examined the behavior of seven developing Asian countries and analyzed the impact of public external debt on social sector spending using a 31 year panel dataset from 1980 to 2010. Their empirical analysis is conducted using the General Method of Moment (GMM) estimation and they reveal that the outstanding external debt and its servicing liability have an adverse impact on public spending, particularly on social sector spending. They suggested that developing countries need to mobilize their own resources and minimize their dependence on external borrowing as far as possible. In another study Matelis (2014) investigated the external debt effect on different economic sectors that is on agriculture, manufacturing and services sectors in Latin America using the panel dataset from 1980 to 2011 and found a negative effect on agriculture and manufacturing sectors indicating an unfavorable pressure on these sectors growth, while a positive effect on services sector. Their finding also suggest that debt servicing indicates crowding out effect of investment from agriculture and services sectors and contradicting results for manufacturing sector. A study by Fatma (2014) shows a negative effect of the total external debt to GDP and external debt as a percentage of GNI ratios on economic growth and a negative interaction between these two debt measures and investment which is analyzed on the effect of external debt on economic growth of 19 developing countries over the period 1990-2011, through the use of a dynamic panel data model.

On the other hand, Uzun, et al., (2012) analyzed the relationship between Public indebtedness and growth rate of transition countries by panel autoregressive distributed lag model (ARDL) for the period from 1991 and 2009. They found a positive relationship between external debt and growth rate of the countries in long run. Their suggestion shows that External debt has positive effect on the growth rate of transition countries just for now but they should perform disciplined fiscal and monetary policies, also they should balance current account.

A study by Checherita and Rother (2010) tried to show the average impact of government debt on per-capita GDP growth in twelve euro area countries over a period of about 40 years started in 1970. They found a non-linear impact of public debt on growth with a turning point beyond which the government debt to GDP ratio has a deleterious impact on long-term growth at about 90-100% of GDP. Their finding also revealed that the negative growth effect of high debt may start already from levels of around 70-80% to GDP ratio. The public debt to GDP ratio negatively and linearly associated with per-capita GDP growth in their study. Another study by Jernej, et al., (2014) evaluated the direct effect of higher indebtedness on economic growth for EU countries for the period 1980 to 2010. They divided the member states into 'old' member states and 'new' member states and they employ panel estimation on a generalized economic growth model augmented with a debt variable. They found a statistically significant non-linear impact of public debt ratios on annual GDP per capita growth rates which is the calculated debt to GDP turning point, where the positive effect of accumulated public debt inverts into a negative effect at 80% to 94% for the 'old' member and at 53% to 54% to new member states.

Schclarek (2004) also investigated the relationship between gross government debt and per capita GDP growth in developed countries for a sample of 24 industrial countries with data

averaged over thirty year periods between 1970 and 2002. In contrast, another study by Reinhart and Rogoff (2010), analyzed the developments of public debt and the long-term real GDP growth rate in a sample of 20 developed countries through simple correlation statistics over a period spanning from 1790 to 2009. They found that (i) the relationship between government debt and long-term growth is weak for debt/GDP ratios below a threshold of 90% of GDP; (ii) above 90%, the median growth rate falls by one percent and the average by considerably more. Kumar and Woo (2010) studied the impact of high public debt on long-run economic growth based on a panel of advanced and emerging economies over almost four decades and results of the study suggest an inverse relationship between initial debt and subsequent growth. In other words, their study shows that a 10 percentage point increase in the initial debt to GDP ratio is associated with a decline in annual real per capita GDP growth of around 0.2 percentage points per year with the impact being somewhat smaller in advanced economies. Their study also reveals some evidence of nonlinearity with higher levels of initial debt having a proportionately larger negative effect on subsequent growth and the adverse effect largely reflects a slowdown in labor productivity growth mainly due to reduced investment and slower growth of capital stock.

A study by Gohar, Bhutto and Butt (2009) indicate the impact of external debt servicing on the growth and development by using a panel data from 1990 to 2008 in low income countries. They found that external debt servicing is statistically significant and has positive impact on growth and low income countries should go for the option of debt forgiveness but not much as their overcrowding may hurt the economy. The same study by Abuzaid (2011) examined the impact of external debt on economic growth and external debt service on investment in Tunisia, Egypt and Morocco over the period 1982 to 2005 by employing Chowdhury growth and investment

models. The result reveals that external debt does not affect growth directly, but external debt affects investment positively and that external debt in selected countries encourages investment rather than depresses it. Furthermore, his study also confirms that there is no sign of a crowding out effect.

Clements, Bhattacharya, and Nguyen (2003) studied about the channels through which external debt affects growth for 55 low income countries employing both fixed effects and system General Method of Moments (GMM), their results suggest that the substantial reduction in the stock of external debt for HIPCs would directly increase per capita income growth by about one percentage point per annum and reductions in external debt service could also provide an indirect boost to growth through their effects on public investment. Presbitero (2008) also examined the relationship between external debt and economic growth, focusing on the role played by the policy and institutional framework for a panel of 114 low and middle income countries over the period 1980 up to 2004. His result show that the debt-growth nexus depends on institutions and policies. A study by Shabir (2013) explores long-run relationship between external debt and economic growth in developing economies for the period from 1976 to 2011. The result indicates that there is a negative relationship between external debt and economic growth. That is an increase in external debt stock reduces the fiscal space to service external debt liabilities and reduces the level of private fixed capital formation and thus dampens the economic growth of developing countries.

We can conclude from the above empirical studies that the empirical finding on the relationship between public external debt and economic growth is inconclusive. Hence, from the literature review we understand that the effect of public external debt on economic growth has a

significant positive, negative and an inverted U shaped relationship or it has no significant effects. As we have discussed earlier, studies in Ethiopia on external debt and economic growth are not clear and sometimes even inconsistent. All studies in Ethiopia did not separate public external debt from the total external debt and this results difficulty in specifying the right relationship between economic growth and public external debt. According to Cecchetti et al., (2011), public external debt and private external debt have their own side effects on the economy. Therefore, in order to determine the real effects of debt level on the economy, public external debt and private external debt should be considered separately. This separation helps to specify channels how public external debt affects the economy. Moreover, Mankiw , Romer and Weil (1992), and Barro and Sala-i-Martin (1995; 2004), Checherita and Rother (2010) indicates that real GDP per capita is taken as the best proxy for economic growth since it considers the standard of living of the society. However, the previous studies did not use this proxy for investigating the relationship between debt and economic growth in Ethiopia. Therefore, by using the recent method in time series method of analysis[9] (ARDL), this study will contribute to the literature by filling the above mentioned gaps observed in previous studies in Ethiopia.

[9] According to pasaran et al., (2001), Autoregressive distributive lag model is the best time series method of analysis for small sample sizes at the moment since it has more advantages over the Granger causality and Johansons co-integration approaches.

CHAPTER THREE

3. Debt Profile and Performance of Ethiopian Economy

3.1. Overview of Macro Economic Performance of the Economy

Ethiopia is one of the least developed countries with a total population of over 94 million in 2015. It is one of the most populous countries in Africa with a per capita income of 573 US $ in the year 2014 (World Bank, 2015). According to the International Monetary Fund (IMF) ranking Ethiopia is among the five fastest growing economies in the world and its real GDP growth rate averaged 10.3% per annum in 2014. Over the 12 months of the country's fiscal year from July 2013 up to June 2014, all of the economy's main sectors performed well (IMF, 2014).

Ethiopian economy is characterized by the dominance of agricultural sector in both employment and output, which implies that, the performance of the economy depends on the performance of the agricultural sector. The agriculture sector accounts for 42% of GDP, 80% of employment and 85% of Ethiopia's export earnings. However, the agricultural sector suffers from poor cultivation practices and frequent droughts. The banking, insurance, and micro-credit industries are restricted to domestic investors, but Ethiopia attracts significant foreign investment in textiles, leather, commercial agriculture and manufacturing (IMF, 2014).

The economic performance of Ethiopia is interrelated with the political process, conflicts, government change and policy changes. Under the imperial regime (Before 1974) the macroeconomic policy was mainly informed by a market oriented economic system. But under the Derg or socialist period (1974-1991) there was a centralized economic system where the state or government played a significant role in all aspects of economic activity. Under the EPDRF or the post Derg period (since 1991) the economy is again operating by a developmental state. Such

cyclical political process and regime shifts are unpredictable and violent. Economic insecurity pervades the system as a rule of law, enforcement of contracts and property right insecurity are configured on unstable political base. Therefore, the detrimental impact of such political process and policy changes on macro economic performance are obvious (Alemayehu, 2011).

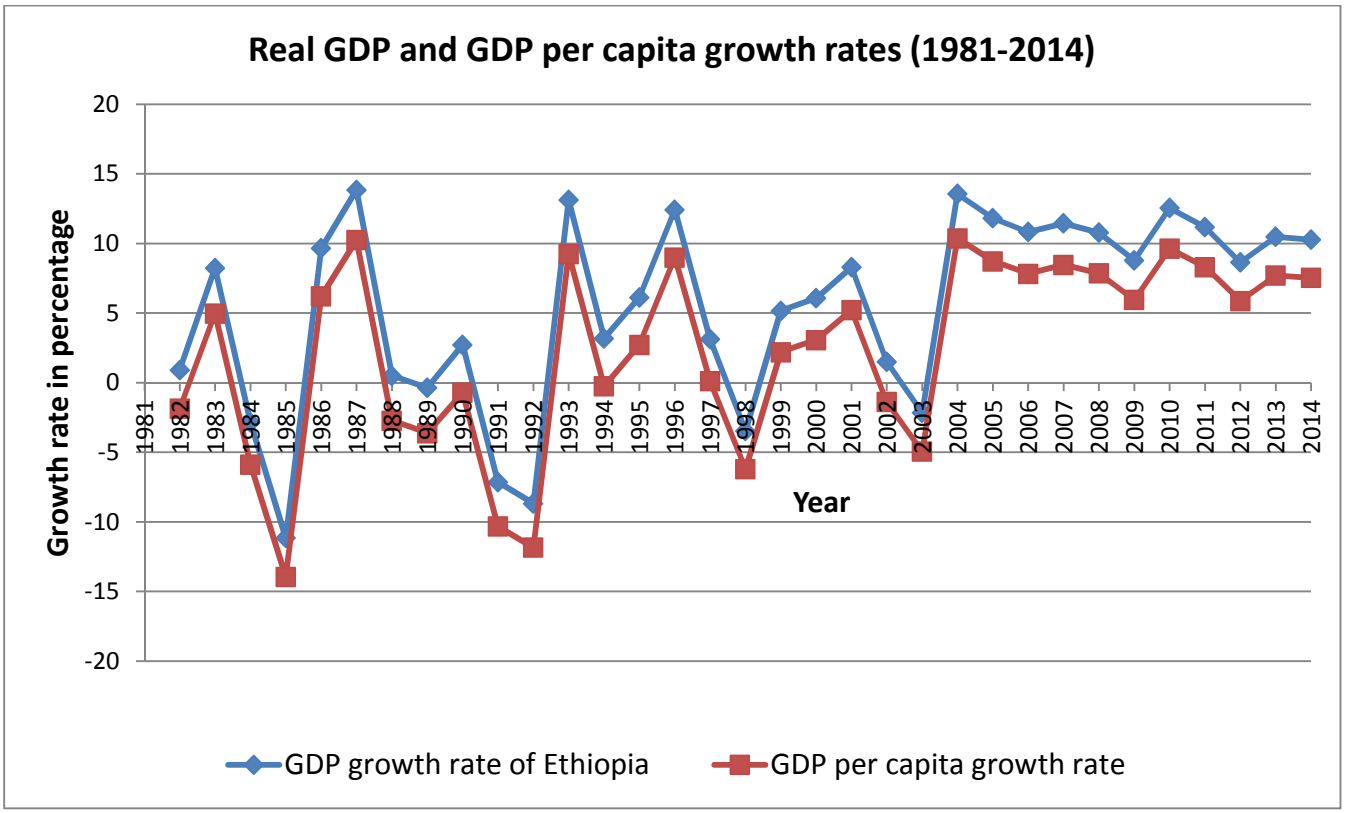
The performance of the Ethiopian economy during the Derg period[10] was unsatisfactory on account of civil war, recurrent drought, high population growth and inappropriate economic policy and management. During the Imperial era, the economy grew at a linear growth rate of 4.1 percent per annum, while population and per capita income grew by 2.3 percent and 1.8 percent per annum, respectively. In the same period, the value added in the agricultural sector grew by 2.1 percent while the other sectors grew by more than 6.8 percent per annum. During the Derg period (1974/75-1990/91), the growth performance of the economy was dismal. In this period, the GDP growth rate of 2.1 percent per annum was not even enough to keep the level of per capita income constant with a population growth rate of 2.8 per annum, per capita income declined by about 0.7 percent per annum. When we subdivided the period, during the period 1974/75-1977/78 the growth rate was 0.3 percent and the growth rate in per capita being -2.3 percent. This was mainly due to the instability with new economic policy and the war with Somalia. But during 1978/79-1982/83, as the result of stability and good weather condition, growth rate increased to 4.6 percent and per capita income became 1.8 percent. In 1983/84 and 1984/85, growth decreased by 5.7 percent and 9.1 percent respectively, due to severe drought. Specially, the decelerated in GDP to -0.7 percent in 1982/83 is mainly related to the sharp

[10] This period was characterized by a political system dominated by some military groups and it largely pursued a command market system. Moreover, this period is considered where operation of the economy as well as the building of infrastructure is aggressively carried by this military power.

decline in industry value added (-8.3 percent) due to the collapse in manufacturing (-8.3 percent) and construction (-14.7 percent) despite a growth in mining. In the years 1985/86 and 1986/87 this rate moved to an average of about 12% as the result of recovery of the economy, but it again fall to -0.01 percent in 1988/89. This indicates that growth episodes under the Derg regime are extremely irregular (Alemayehu, 2002).

In the post 1991, the new regime adopted typical structural adjustment policies with the support of the Bretton Wood institutions. Therefore, in terms of economic policy, this period witnessed a marked departure from the previous "Socialist" system of command economy that repressed the private sector. As a result, during this period, relatively good economic performance has been recorded. The revival of growth appears to be the combined result of the reforms and favorable weather conditions. Growth performance has nonetheless been fragile and uneven on a year to year basis; growth was heavily dependent both on the vagaries of nature and on external shocks (Alemayehu, 2003). Accordong to the World Bank (2015), economic growth during this period (1991-2014) was quite impressive and the real total and per-capita GDP grew at average rates of 6.58 % and 3.54 % per annum, respectively (see figure 3.1). The average rate of growth in real Gross Domestic Product for the study period is 5.44 % per annum. The per capita GDP increased in average growth by 2.36 % (World Bank, 2015).

Figure 3.1: Trend of Real GDP and GDP per capita growth rates

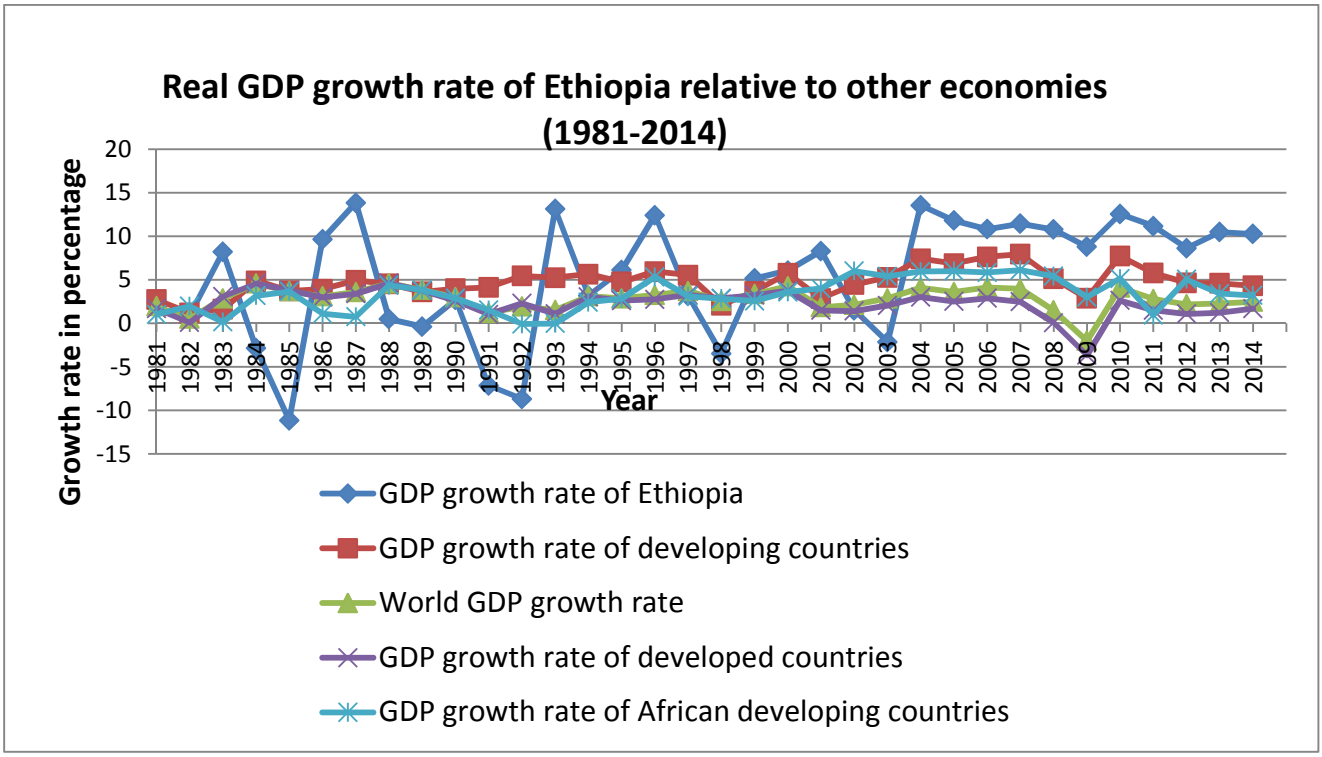


Source: World Bank (2015)

After 1991 or under the post Derg period, real GDP and GDP per capita shown a remarkable increase and grew on average by 6.58 % and 3.54 % per annum. Now the recent five years data (2010 up to 2014) shows that Ethiopian economy is growing at faster rate; average real GDP growth rate 10.63 % and 7.81 % average growth rate of GDP per capita. From this one can understand that the real GDP and GDP per capita growth rates are more impressive between 1992 and 2014.

Ethiopia has experienced strong economic growth in recent years. With real GDP growth at or near double digit levels since 2004, the country has consistently outperformed most other countries in Africa and expanded much faster than the continent-wide average.

Figure 3.2: Trend of Real GDP growth rate of Ethiopia Relative to other economies



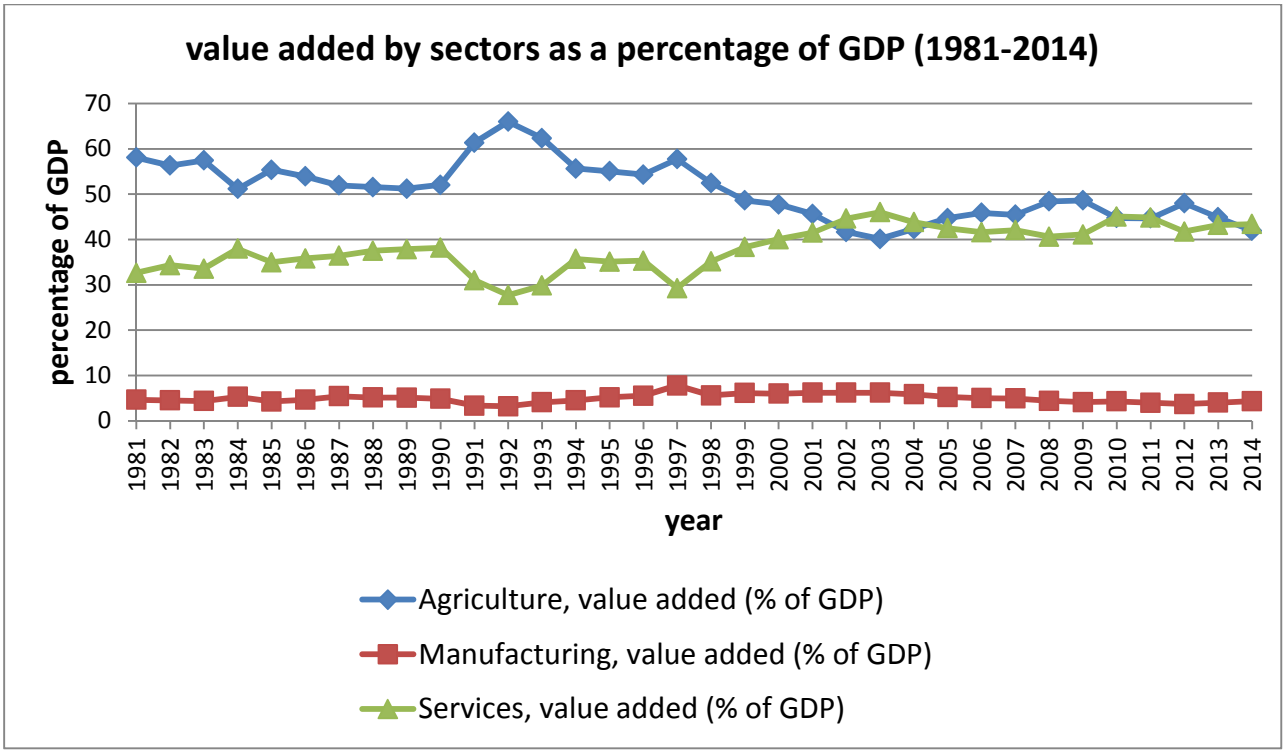
Source: World Bank (2015) and UNCTAD (2015)

Looking into economic performance of the country, it is getting better both in terms of GDP and GDP per capita (grew on an average by 5.4 % and 2.4 %). This performance enables the country to register higher real GDP growth rate and per capita income growth performance than higher income countries (2.26 %), developing countries (4.74 %), African developing countries (3.31 %) and the world real GDP growth rate (2.81 %). World Bank (2015) pointed out that good performance in the last 15 years has largely been explained by the existence of peace and stability in relative terms and economic reforms. But the country still faces some structural weaknesses that present significant challenges in the medium term.

Even though initially the economy is led by the agricultural sector, the growth base is broadening with increasing contributions to value added of GDP from services and industrial sector**.** But still

the agricultural sector is the back bone of Ethiopian economy, although its performance is not satisfactory and its techniques of production are backward.

Figure 3.3: Trend of Value added by sectors as a percentage of GDP



Source: World Bank (2015)

During the entire period from 1981 up to 2014, the share of the value added of agriculture, industry and the service sectors were 50.8 %, 4.95 % and 38.2 %, respectively. As can be seen from the above diagram during the study period or for the last 34 years, the share of the value added by the agricultural sector accounts for the largest share and the service sector is the second largest sector for the contribution of the total GDP value added. The value added by the service sector increase significantly where its share during current government rose to 39.5 % compared to 35.4 % of the periods from 1981 to 1991. Similarly, the shares of industrial sector show an

increment, but such increments are very small and marginal. In contrast, the share of agriculture reduced modestly specially after the year 2000 and it was 44.9 %. This means that the decline in the share of agricultural sector by 5.2 % after the year 2000 largely compensated by the service sector which was 42.8 % after that period, where the share increased by 4.6 % per annum.

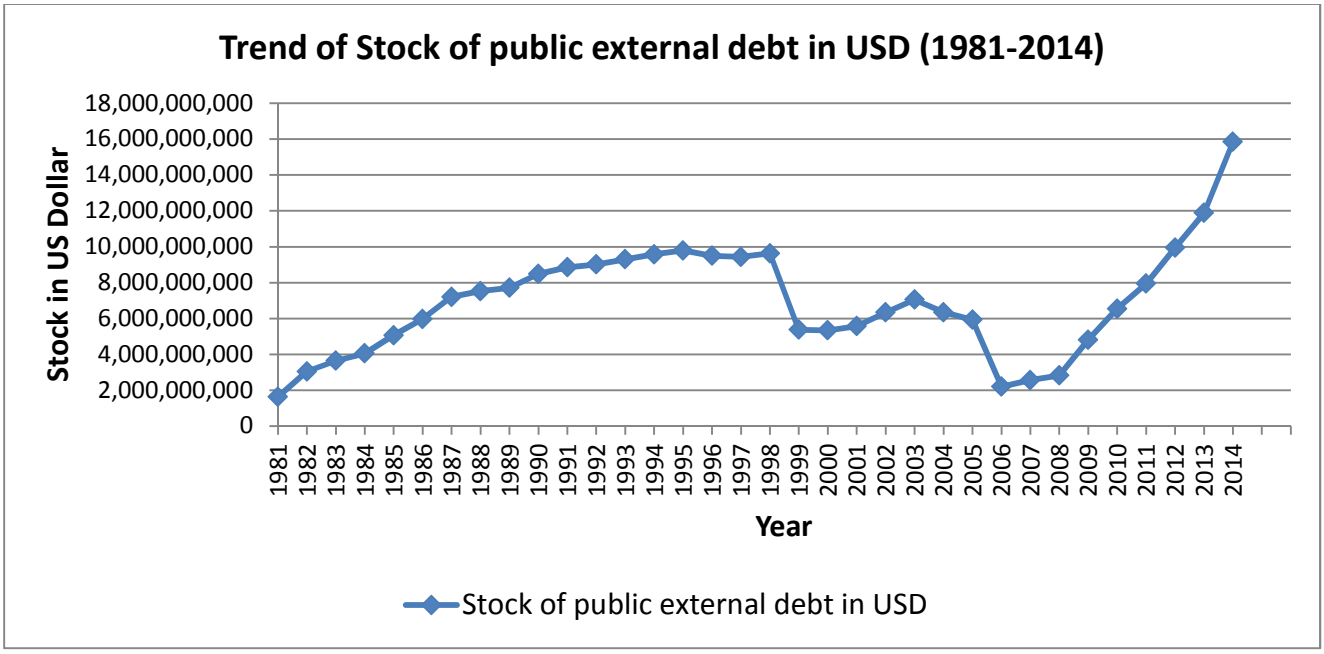
As we can understand from the above figure, the share of the value added by the service sector in GDP has been rising, while that of agriculture has been declining steadily. The agriculture sector's share of GDP declined by five percentage points between 2000 and 2014 and has now been surpassed by services. The contribution of the industrial sector is small and has shown no appreciable change in recent years. It has averaged about 4.07 % of GDP in the last five years. Owing to the recent liberalization measures, the service sector has registered a relatively significant change which increased its contribution to value added of GDP from 31% in 1990 to 43.4% in 2014 (World Bank, 2015). Generally, the economic structure of the country has not changed significantly and the economy is dominated by agricultural sector, although its share is reducing modestly in recent period.

3.2. Evolution of the Ethiopian External Debt and Current Profile

Ethiopia is among one of the highly indebted countries in the world by the standards of HIPCs of World Bank, International Monetary Fund and even Sub-Saharan Africa. The historical evolution of the foreign debt of the country shows that the size of the external debt significantly increased after the fall of the Imperial Regime in the mid 1970s. The magnitude of the external debt in 1975 was only US $371 million. But the total external debt increased significantly in 1998 and it was US $9.7 Billion or 123% of GDP. The largest share of this debt was owed to the World Bank Group. But before 1991, the share of Multilateral Institutions in the total external

debt during the previous Derg regime was only 16.8%; about 54% of that total debt was contracted for defense purposes and helped neither in improving the productive capacity of the economy nor in alleviating poverty. The major share (76.4%) of the debt was owed to bilateral creditors, in which the former Soviet Union alone accounted for about 78% of the total bilateral external debt (Teklu, 2000; World Bank, 2015).

Figure 3.4: Trend stock of public external debt over years

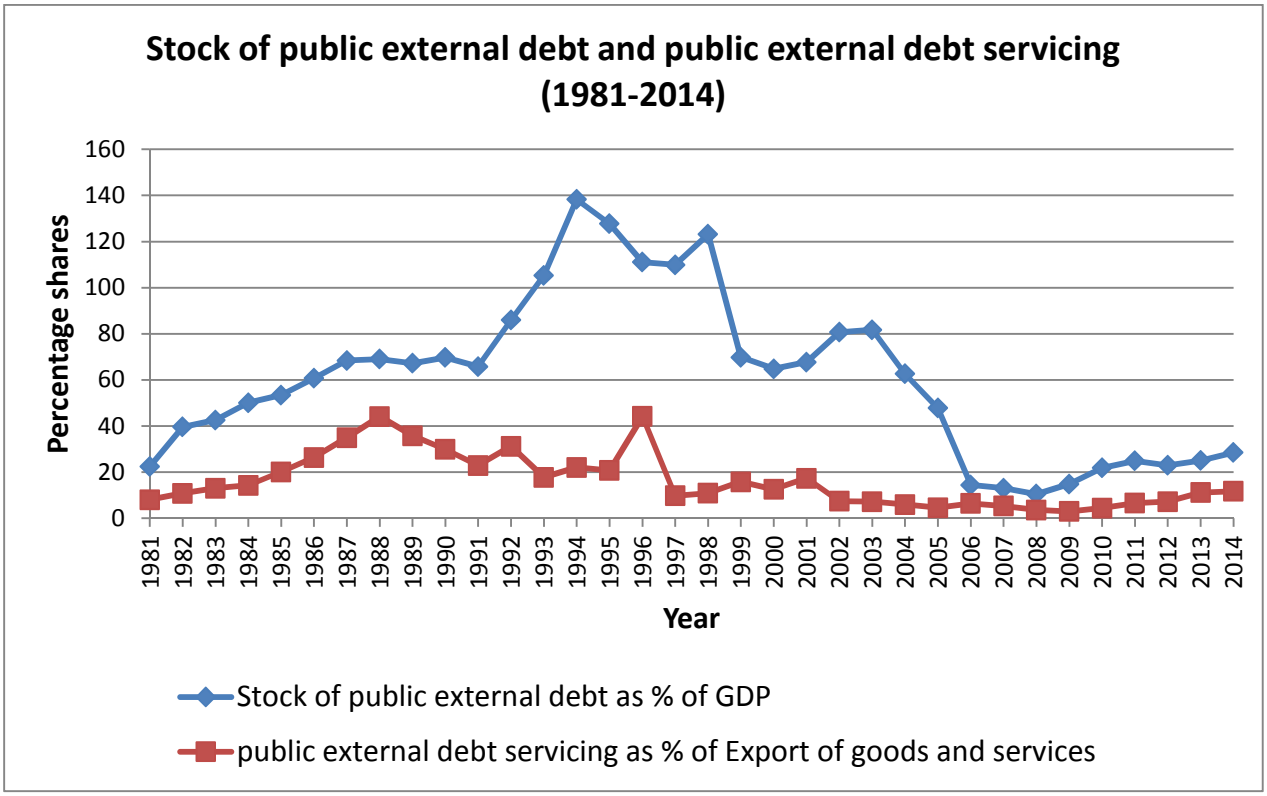


Source: World Bank (2015)

The above figure shows the public external debt trend for Ethiopia starting since 1981. The country's public external indebtedness significantly increased in the 1980s and 90s. This was mainly related to the arms procurement due to the internal war that was going on at that time. But following the debt relief granted to benefit the Heavily Indebted Poor Countries (HIPCs), Ethiopia became eligible for this grant and reached the decision point in November 2001 and completion point in 2004 (IMF, 2007 and 2012).

In addition to the HIPC initiative, the Multilateral Debt Relief Initiative (MDRI) was also launched in 2006 with the aim of supplementing the HIPC initiative by further granting or cancelling the outstanding external debt stock of poor countries. Hence, Ethiopia received an additional US$2.3 Billion from the MDRI and both the above initiatives contributed a lot to the reduction of the Ethiopian debt stock and hence to the likelihood of its sustainability (IMF, 2007). Financial crisis at that time is also another reason and together these led to a sharp decline in the public external debt stock in 2006 and the improvement to GDP ratio and it declined to US$ 2.2 Billion (14.4% of GDP). However the public external debt stock has continued to increase time to time despite the several debt cancellation and restructuring initiatives that the country has gone through due to higher borrowing by public enterprises. In 2014 this figure increased to US$ 15.9 Billion (28.5% of GDP).

Figure 3.5: Stock of Public external debt and public external debt servicing over years

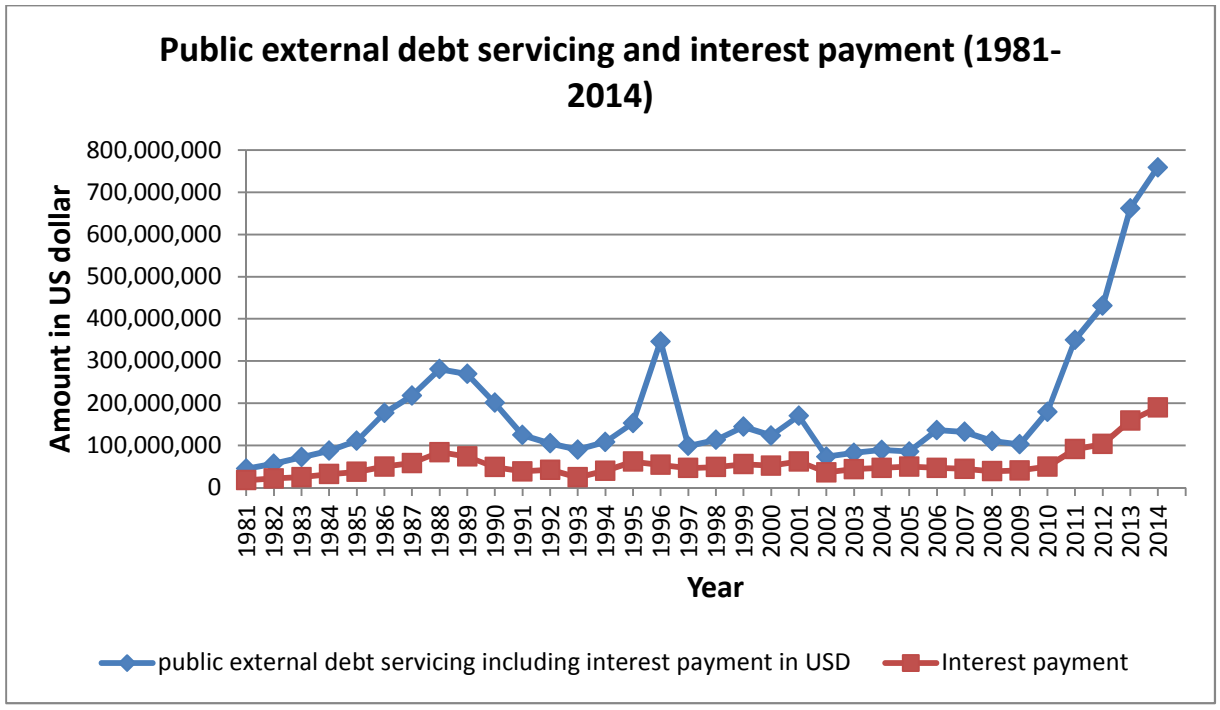


Source: World Bank (2015)

This increasing accumulated external public debt stock has been one of a serious macroeconomic concern since 1980s. Among the main reasons for this concern were that the amount of debt that had been accumulated by Ethiopia was huge relative to the size of its economy, as measured by the relative share in GDP. The ratio of public external debt to GDP in 1981 was 22.4% and it significantly increases from time to time in the Derg regime. This ratio was in its maximum point at the year from 1994 up to 1998 for which its average annual ratio was 121.2% of GDP. But it showed a massive improvement following the HIPC and MDRI debt cancellation for poor countries in 2006 and the average value of public external debt to GDP ratio for the period 2006 up to 2009 was 13.2%. For the last five years ranging from 2010 up to 2014 its value is 24.6% to GDP ratio. The above figure also shows that the debt service to exports of goods and services

ratio and it remained at about 16.1% per annum for the year 1981 up to 2014. It reached its maximum point in 1988 and 1996 (44% and 44.1% of export of goods and services, respectively). For the last five years, its value improved well to 8.2% and it is below the sustainable threshold. This is due to servicing of non-concessional loans by public enterprises.

Figure 3.6: trend of public external debt servicing and interest payment over the years



Source: World Bank (2015)

It is known that the borrower country or government will pay the external debt that it borrowed in the past from the international market and this payment includes principal plus interest payment in which the rate is agreed by the two parties during initial borrowing. Ethiopia is well known by its huge amount of public external debt stock and public external debt servicing throughout the year. The total public external debt servicing for the year 1981 up to 2014 was USD 6.29 billion with the smallest payment of USD 44.5 million in 1981 and the largest USD

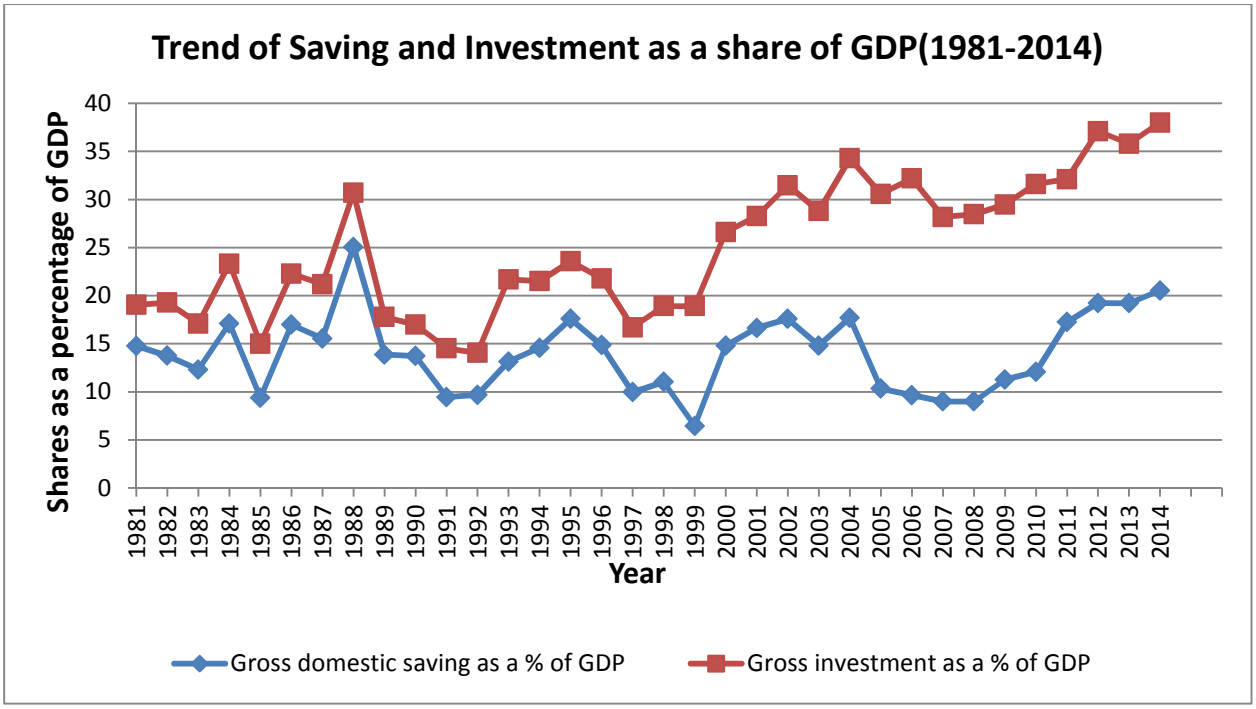
759.1 million in 2014. The interest payment alone was totally USD 1.91 billion with the smallest interest payment of USD 17.2 million in 1981 up to the largest interest payment of USD 189.6 million in 2014. After 2010, both the interest payment and the total external debt payment are increasing from year to year. This huge amount of currency outflow may cause the deterioration of domestic resources and will create tradeoff between external debt payment and domestic investment which is known as the crowding out effect of external debt in the economy (World Bank, 2015).

3.2.1. Reasons for Government External Borrowing in Ethiopia

3.2.1.1. Resource gap (The gap between saving and Investment)

Economic growth is significantly affected by the rate of capital formation or investment that in turn is related to the amount of saving. According to IMF (2014), the relatively low amount of GDP per capita implies that the scope for substantial mobilization of domestic savings in the short run is limited. At the same time, the government's policy of keeping the real interest rates negative is not conducive to saving and distorts financial intermediation. Hence, the low level of gross domestic saving is a classic feature of low income countries in general and Ethiopia in particular. The data for Ethiopia for the period, 1981-2014 indicates a resource gap which is measured by a difference between gross domestic savings and gross domestic investment. As figure 3.7 shows, this gap is huge in size and has also widened during this period (World Bank, 2015). Therefore to compliment this less amount of gross domestic saving and implement the investment or capital formation in the country, external borrowing is among the important mechanisms in bridging this resource gap.

Figure 3.7: Resource gap (trend of saving and investment)



Source: World Bank (2015)

The country registered gross capital formation of average value of 24.92% of GDP per annum. In terms of regimes between 1981 and 2014, higher gross capital formation registered during the period 1992 up to 2014 or under EPRDF regime (27.4% of GDP) as opposed to Derg regime or from the period 1981 up to 1991 (19.7% of GDP). The lower gross capital formation during Derg was as the result of political instability, where considerable share of recurrent expenditure and GDP were allocated for military expenses. But in post Derg periods the gross capital formation shows significant improvement.

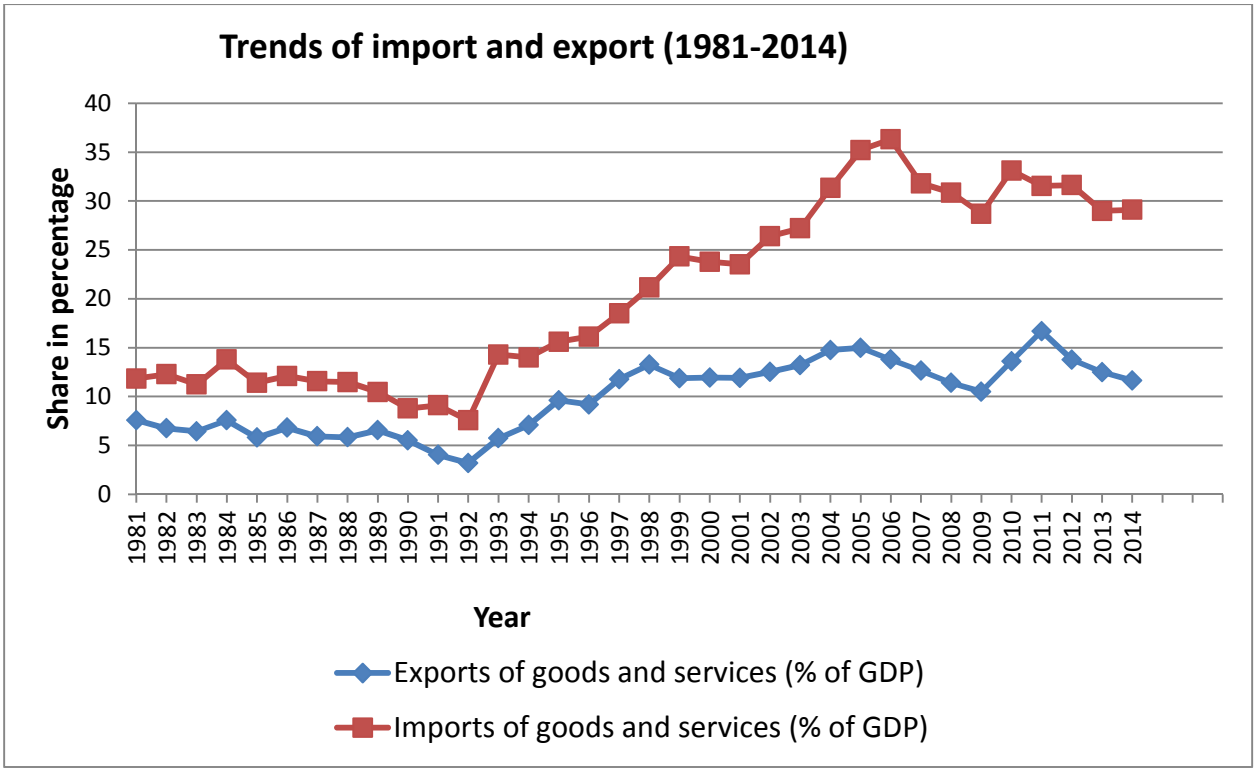
On an average gross domestic saving amounted 14.07% of GDP between 1981 and 2014; averaged about 14.72% and 13.76% of GDP, respectively, in the Derg and EPRDF regimes. Therefore, gross domestic saving in Derg regime was better than EPRDF regime in relative to its

share with GDP. The World Bank report shows that gross domestic saving for the country is not only low, but also among the least in the world. The reason for this low gross domestic saving in Ethiopia is due to subsistence economy of the nation, where gross consumption expenditure consist a lion share of GDP. Low per capita income and low propensity to save are also the reason for lower saving in the country. The lower gross domestic saving of the nation would have its own implication in an endeavor of capital formation and accumulation. The World Bank data base indicates that the average resource gap (the difference between gross domestic saving and gross capital formation) is 10.85% of GDP throughout the period and this gap has widened from time to time.

3.2.1.2. Current account gap (Trade balance)

Trade Balance is described as the visible balance which represents the difference between receipts for exports of goods and services and expenditure on imports of goods and services. Between 1981 and 2014, the value of Ethiopia's export, import and total trade (in current USD Million) rose tremendously. Looking the current account record, the annual average value of export and import have been 9.9% of GDP and 20.7% of GDP respectively (World Bank, 2015).

Figure 3.8: Current account gap (trend of Import and Export)



Source: World Bank (2015)

As it is known economic growth is accelerated with increased volume of export, rising export prices and diversification of export commodities. Many of the export commodities of Ethiopia are primary products and the contribution of the industrial sector still remained at low level. Coffee continued to dominate the country's export, followed by oilseeds, chat, pulses and skins/leather products. From the agricultural origin primary export commodities of the country, only few of them are gone through a value-added process. Primary products will obviously generate more value if they are processed in domestic manufacturing industries. The question still remains whether they still attract the export markets after being processed in the domestic industry. Because of this low attractiveness when they processed in the domestic, most of the

marketable primary agricultural commodities are exported to foreign industries (Samuel and Tarekegn, 2011).

The export value as a percentage of GDP under the Derg regime (1981-1992) was 6.25% of GDP and it was not impressive since privatization and trade liberalization were restricted during this time. But under the EPDRF (1992-2014) regime it has shown a significant increase and it was 11.63% of GDP. The EPRDF's foreign trade policy has mainly focused on ensuring private sector participation, managing the sector by issuing foreign exchange policy and import-export regulation, designing and providing incentive to the export sector and replacing quantitative restriction with tariff. In view of high demand for foreign exchange, one sustainable source of financing is growth of the export sector (Alemayehu, 2011). According to IMF (2014) transportation and travel service exports performed well under this period, which is boosted by the aggressive expansion of Ethiopian Airlines and growing tourism.

The country's aggregate import value as a percentage of GDP over the past 34 years (1981-2014) was 20.7% of GDP which ranges from 11.27% of GDP in Derg regime to 25.26% of GDP in post Derg period (World Bank, 2015). Consistent increases were not observed in all products, and imports fluctuated from year to year. The largest share goes to the import of machinery and equipment, and fuel appeared to be the second import product followed by organic and inorganic chemical products, food and beverage and metallic.

In the last three decades the Ethiopian external sector can be characterized as a net importer from the international market and despite the increasing growth of exports over the years, the trade deficit of the country continued to remain large as the growth of imports also accelerated faster than export growth during the same period. The magnitude of the current account deficit

increased from 5.02% of GDP in the Derg regime to 13.63% of GDP in the EPRDF regime, exhibiting an increasing trend of trade balance gap. This gap has been financed largely by concessional and non-concessional external debt and other foreign inflows as well as by foreign direct investment (FDI).

3.2.1.3. Budget deficit (The gap between Government Revenue and Expenditure)

The government's budget deficit is conventionally defined as the difference between government revenue and government expenditure. Compared to other sub Saharan African countries and other developing countries, the overall budget deficit as percentage of GDP is among the highest in Ethiopia and it is quite clear that the government budget balance has never been positive or in surplus since 1980's (see table 3.1). Moreover, the extent of the budget deficit has undergone significant increase over the periods. When we see its trend after 1981, the minimum deficit is recorded in the year from 1980/81 up to 1984/85 and the maximum and worst level of the budget deficit have seen in the year from 2010/11 up to 2014/15 (MoFED, 2014/15).

Table 3.1: Budget deficit (trend of Government revenue and expenditure)

Year	Government revenue including grants -in Billion Birr	Government expenditure- in Billion Birr	Budget deficit (in Billion Birr)	Budget deficit (as % of GDP)
1980/81-1984/85	12	15.68	-3.68	4.8%
1985/86-1989/90	18.84	23.89	-5.05	5%
1990/91-1994/95	21.54	29.74	-8.2	4.7%
1995/96-1999/00	49.48	63.29	-13.81	4.3%
2000/01-2004/05	79.86	101.64	-21.78	4.6%
2005/06-2009/10	214.33	238.24	-23.91	1.6%
2010/11-2014/15	696.12	783.04	-86.92	1.6%

Source: MoFED (2014/15) and Author's calculation

Government expenditure is composed of recurrent expenditure which are recurring in the process of delivering government economic and social services and capital expenditure which recurs on development projects that result in the acquisition of fixed assets and thereby enhance the capacity of the country for the production of goods and the provision of economic and social services. During the study period under review government expenditure continued to increase over the years continuously. For the earliest five year period (1980/81 - 1984/85) total government expenditure Birr 15.68 billion. But this statistical value is significantly increased for the last five years (2010/11 - 2014/15) to Birr 783.04 billion. When we see the government revenue, it consistently increased from time to time and in 1980/81- 1984/85, the total government revenue was Birr 12 billion which increased to 696.12 Billion birr in the last five year period of 2010/11 to 2014/1. From this most of it is collected from domestic sources and

while the remaining small portion was collected from external sources such as grants and loans (MoFED data base, 2014/15).

Under the Derg regime (the year from1980/81 up to 1991/92), the budget balance was in a deficit and for the first five years (1980/81 - 1984/85), the amount of the deficit was Birr 3.68 billion. Also for the last five years of the Derg period (1985/86 - 1990/91), the balance was still in deficit and its value was Birr 5.05 billion. This was due to the period's socialist ideology with expanded public sector without adequately expanding government revenue and the expanded war during the period in different directions which incurred to more defense expenditure. The government spending has been growing rapidly in recent years, prioritizing poverty reduction expenditures in the main sectors of health, education and agriculture. This has been contributed to the rise in budget deficit given the narrow tax base of the country. As MoFED (2014/15) shows, even after the introduction of various reform programs under the liberalized regime (1991/92-2014/15), the budget deficit has also increased. This clearly indicates that there is an excess of government expenditure over revenue, which leads to huge budget deficit and to be widened over time because the increase in government expenditure is much higher than that of the increase in government revenue. Therefore, to finance this observed gap over time, the government of Ethiopia has been used from both external and domestic sources and these external sources include external borrowing and grants.

3.2.2. The correlation between public capital formation and public external borrowing in Ethiopia

Economic theory assumes that economic growth can be promoted through factor accumulation and productivity growth with a reasonable level of debt. This is due to, countries at initial stage of development incline to have insufficient domestic financial resources and limited investment opportunities which make them to require external assistance. Then, it becomes useful to invest in foreign borrowing in order to fill the saving investment gap so as to attain the targeted rate of growth. Gross public investment includes investment by government and/or public enterprises financing through public external borrowing. Hence, public external borrowing increases the total supply of resources existing to a country and thus, increases the feasible size of domestic spending on public projects. Therefore, this public external debt is useful when the government makes use of it for projects, which are investment-oriented. This implies that a significant portion of public external borrowing can be changed to public capital formation in the economy Shuaib et.al, (2015)**.**

Table 3.2: the correlation between public external borrowing and public capital formation in Ethiopia

	PED	PUK
PED	1	0.224032
PUK	0.224032	1

Source: output from Eviews 9

Hence, to check the extent and magnitude of correlation between public external borrowing and public capital formation in Ethiopia, this study examined the correlation test between these

variables and the result is presented in Table 3.2 above. As we can understand from the result, in Ethiopia there is a moderate positive correlation between public external borrowing and public capital formation. This positive correlation implies that there is a value of public capital formation which associated with some value of public external borrowing. In other words, within a specified period of time some amount of public external debt inflows are positively linked with public investment and some parts of this debt have been changed to public capital.

3.2.3. Sources of Public external debt in Ethiopia

Under the international financial market, the lender countries and institutions can be categorized into multilateral, bilateral and private creditors. The multilateral creditors contain big economic institutions such as World Bank, International Development Association (IDA), International Monetary Fund (IMF), African Development Fund (ADF), and African Development Bank (ADB). While the group of official bilateral creditors includes the Paris Club creditors and also Non-Paris club creditors and the private creditors are those which are commercial creditors and suppliers.

Table 3.3: The share of each foreign lender from the total borrowing (percentage share)

Creditors	**Years**							
	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15
1.Multilaterals	**51.8%**	**53.5%**	**58.4%**	**62.7%**	**63.5%**	**82.6%**	**81.1%**	**48.9%**
2. Bilateral	**46%**	**44.6%**	**40%**	**36%**	**32.9%**	**11.3%**	**12.9%**	**33.1%**
Paris club	34.6%	34%	30.4%	27.9%	25.7%	3.7%	5.6%	15.1%
Non-Paris club	11.4%	10.6%	9.6%	8.1%	7.2%	7.6%	7.3%	18%
3. Private creditors	**2.2%**	**1.9%**	**1.6%**	**1.3%**	**3.6%**	**6.1%**	**6%**	**18%**
Commercial banks	2.2%	1.9%	1.6%	1.3%	3.1%	5.5%	5.4%	18%
Suppliers	0	0	0	0	0.5%	0.6%	0.6%	0
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: Compiled from data base of MoFED 2014/15

Although the multilateral creditors have a largest share in giving credit to the Ethiopian government, the share of each creditor is different from year to year. For example, in 2007/08 the multilateral creditors lend 51.8% of the total borrowing and the bilateral creditors share was 46% of the total money. From the bilateral creditors, 34.6% was from the Paris club creditors and the remaining 11.4% was from the Non Paris creditors. At the same year only 2.2 % of the total borrowing of the Ethiopian government was from the Private creditors which are commercial creditors. After seven years in the fiscal year of 2014/15, these figures are slightly changed and the share of multilateral creditors was 48.9% of the total borrowing. The bilateral creditors share at this time decreased to 33.1% (of which 15.1% was from the Paris club creditors and the

remaining 18% was from the non Paris creditors) and the private creditors (commercial creditors) share increased significantly to 18% of the total borrowing. Generally speaking, the current level of external public and publicly guaranteed debt is largely concessional and is held almost equally between multilateral and bilateral creditors. From the bilateral creditors, the Paris Club creditors have a significant share (mostly China and India), while that of commercial creditors is very small.

CHAPTER FOUR

4. Model Specification and Methodology of the Study

4.1. Theoretical Framework and Model specification

The theoretical foundation of the study is based on the augmented Solow model and endogenous growth model for economic growth equation which aims to show the impact of public external debt on economic growth of Ethiopia. It is constructed based on the theoretical framework of the augmented Solow Model and endogenous growth model with a modification that extends the basic production function framework to permit human capital as an additional input in to the production function following Romer (1996) and Debt burden following Cunningham (1993). As implied by Solow's formulation, economic growth is a function of capital accumulation, an expansion of labor force and exogenous factor, technological progress which makes physical capital and labor more productive. According to the endogenous growth model, human capital influences economic growth as:

$$Y = f(K, HK, LF, A) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where Y= is a proxy for economic growth, K= Capital stock, HK= Human Capital, LF =Labor force and A= technology.

Endogenous growth model does not consider the impact of external debt burden on the economic growth. But Cunningham (1993) revealed debt burden is vital determinant of economic growth specially for those who are developing and highly indebted economies and in his model debt burden was originally included as a primary factor of production in order to examine the effect of external debt on economic growth in sixteen heavily indebted nations. Cunningham (1993) noted

that debt burden can be considered as a debate in the productivity of labor and capital in a manner similar to the inclusion of exports in the production function. Then after including Debt burden as a new variable, the growth model can be expressed as:

$$Y = f(K, HK, LF, DB, A) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

Where Y= is a proxy for economic growth, K= Capital stock, HK= Human Capital, LF =Labor force, DB= debt burden and A= technology

According to Karagol (2002) if a country has significant debt burden, the need to service its debt will affect the employment of labor and capital in the production function and through its effect on the productivity of capital and labor economic growth will be affected. In the model of Shabbir and Yasin (2015) also highly indebted countries have to set aside a sizeable fraction of their scarce resources to service their debt, which naturally affects their development spending. A great amount of foreign exchange reserves is spent on debt servicing accompanied by devaluation of currency and it can affect social spending in particular and the economy in general. Therefore, it is necessary to know the magnitude of relationship of growth with the debt service liabilities and the debt burden should be decomposed to public external debt stock and public external debt servicing. Then the extended model is given by:

$$Y = f(K, LF, HK, PED, PEDS, A) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

Where Y = A proxy for economic growth, $K =$ Capital stock, HK = Human Capital, LF =Labor force, PED = Public external debt stock, $PEDS$ = Public external debt servicing and D = a variable for a policy change.

The economic growth models made by different writers including Mankiw , Romer and Weil (1992), and Barro and Sala-i-Martin (1995; 2004), Checherita and Rother (2010) indicates that real GDP per capita is taken as the best proxy for economic growth since it considers the standard of living of the society. Other variables that are believed to be important in explaining the economic growth (using real GDP per capita, as a proxy for economic growth) model better in the context of the country Ethiopia can be included such as trade openness and policy change. Changes in economic policies can influence the performance of the economy through investment on human capital and infrastructure, improvement in political and legal institutions and so on (Easterly, 1993). Specifically policy changes towards the public external debt can affect the economic growth of the country through the above channels and can be incorporated in to the model using a dummy variable (D). Therefore, the final model of the economic growth equation can be expressed as:

$$GDPpc = f(K, LF, HK, PED, PEDS, TOP, D) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Where $GDPpc$ = Real GDP per capita, K = Capital stock, LF =Labor force, HK = Human Capital, PED = Public external debt stock, $PEDS$ = Public external debt servicing, TOP = Trade openness and D = a variable for a policy change.

Using equation (4) above and expressing the variables in natural logarithmic form, an attempt will be made to look at the relative contribution (elasticity) of each variable to the growth process. The log-linear form of specification enables the researcher to interpret the coefficients the directly as elasticity (Sarmad, 1988). In addition it is also useful for accommodating the hetreoskedasticity problem (Goldstein et al. 1976). Then the empirical model of economic growth can be expressed as:

$$lnGDPpc_t = \beta_0 + \beta_1 lnK_t + \beta_2 lnLF_t + \beta_3 lnHK_t + \beta_4 lnPED_t + \beta_5 lnPEDS_t + \beta_6 lnTOp_t + D + U_t \ldots\ldots (5)$$

Where:

$\beta_0, \beta_1, \beta_2 \ldots \beta_6$ =Parameters to be estimated in the model

$GDPpc_t$ = Real GDP per capita at time t

K_t = Capital stock proxied by private capital formation as share of GDP at time t

LF_t =Labor Force as share of Total Population at time t

HK_t =Human Capital proxied by secondary, tertiary and vocational, school enrollment as a share of population

PED_t =Stock of public external debt as a percentage GDP at time t

$PEDS_t$ = Public external debt servicing as a percentage of export of goods and services at time t

TOP_t =Trade openness at time t

D = Dummy variable for the policy change

U_t =Error term

ln =Natural logarithm

4.1.1. Data source and Measurement of Variables

For the purpose of analyzing the impact of public external debt on economic growth in Ethiopia, secondary data for 34 year annual data for the variables of interest which covered from 1981 to 2014, are used. The data for the problem under investigation is collected from Ministry of Finance and Economic Development (MOFED), National Bank of Ethiopia (NBE), United Nations Conference on Trade and Development (UNCTAD) and World Bank (WB). The time period 1981-2014 is chosen on the basis of the data availability on all the variables that also broadly includes two regimes, Derg and the present regime. The year 1991 has been chosen as the break year on the basis of regime change. The Source and measurement of the variables are briefly summarized in the following table.

Table 4.1: Type and description of the variables

Type of Variable	**Unit/proxy**	**Source**
Economic growth	Real GDP per capita	NBE and WB
Physical capital (K)	Capital stock proxied by private capital formation as share of GDP at time t	WB
Labor force (LF)	Labor Force as share of Total Population at time t	UNCTAD
Human capital (HK)	Human Capital proxied by secondary, teritiary and Vocational school enrollment as a share of population at time t	WB
Public external debt (PED)	Stock of Public external debt as a percentage GDP at time t	MOFED and WB
Public external debt servicing (PEDs)	Public external debt servicing as a percentage of export of goods and services	MOFED and WB
Trade openness (TOP)	sum of export plus import to nominal GDP	WB

4.1.2. Description of the variables and expected theories

The descriptions of the dependent and the explanatory variables that are included in the study model are explained as follows:

GDPpc: 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 and it is assumed to be the best indicator of economic growth which shows the standard of living of the society.

K: Capital stock is defined as the value of the existing supply of physical goods that are used in the production process at a given point of time and includes buildings, machinery, equipment and inventory. There are points of view that capital stock is generally believed to be of critical importance, not only as a component of final aggregate demand, but also in terms of the impact of capital stock on the economy's growth and employment opportunities (Ghali, 1999). In this study, since public investment is correlated with public external borrowing in Ethiopia, capital stock is proxied by private capital formation as a share of GDP to remove double counting of the variables. Hence we expect that private capital formation should have a positive coefficient in explaining economic growth.

LFP: In this study the labor force is defined as the employed and unemployed labor force. Since the rate of utilization of the labor force is important in production, we expect a positive relationship between economic growth and labor force. But if it couldn't be used efficiently and if it is less productive, it may be a burden for the economy because of high rate of unemployment.

HK: In this study human capital is proxied by secondary, teritiary and vocational school enrollments. Romer (1996) and Gungor (1997) notes that human capital which describes the

knowledge and skills embodied in individuals are an important source of economic growth. Human capital accumulation that is the ability of individuals to solve problems and to think critically is believed to promote higher growth by improving labor force which will be more productive. Therefore human capital variable is expected to have positive impact on the production and economic growth of the country.

TOP: trade openness is the sum of export and import divided by GDP and expected to affect economic growth positively. 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.

PED: Stock of public external debt which is the targeted variable in this study can affect the economic growth in different ways. Shuaib et.al, (2015) reveals that the gross public investment includes investment by government and/or public enterprises financing through public external borrowing. Hence public external borrowing is correlated positively with public investment and can serve as financing capital formation in any economy and calls for technical, managerial, and financial support for the borrower countries to bridge the resource gap and contributes for economic growth through more productivity. On the other hand, According to the conventional view of the public debt and/or the overhang theory of Krugman (1988), public external debt acts as a major constraint to capital formation in developing nations by discouraging investment if this borrowing is not used for productive purposes. That is if the burden and dynamics of external debt show that they do not contribute significantly to financing economic development,

it leads to negative contribution for the economy. Therefore stock of public external debt is expected to have either positive or negative impact on the economy.

PEDs: public external debt servicing is also another main targeted variable in this study and it is assumed to have negative effect on economic growth. Rockerbie (1996), and Cunnigham (1993) state that when a government has a substantial external debt burden, the manner in which labor and capital will be exploited in the production process is bound to be influenced by the need to service that debt. Karagol (2002) and clements et al. (2003) argued that external debt service burden has a negative impact on investment and capital accumulation. The main reason is that the greater percentage of capital and foreign currency reserves goes to meet debt service and there will be a reduction in domestic resources because of transferred to principal and interest payments and will leads to poor trade performance. Secondly, when the debtor countries are unable to meet their debt services promptly, they face bad credit standing and will have difficulties in borrowing and pay too much to get new credit.

D: Changes in political and economic policies (the dummy variable D in the model) can influence the performance of the economy through investment on human capital and infrastructure, improvement in political and legal institutions and so on (Easterly, 1993).

4.2. Methodology of the study

Most of the time serious studies in this area previously conducted are used the Eangle Granger Approach following Engle and Granger (1987) and the Johnson's Co-integration technique following Johansen (1988) and Johansen and Juselius (1990). But its outcome could not be reliable for small sample size (Narayan, 2005; Udoh et.al, 2012). Relatively, the Autoregressive

distributed lag method of co-integration (ARDL) has more advantage over the Johnsons method (Pesaran et al., 1999). Johansen co-integration techniques require that all the variables in the system to have equal order of integration, that is the application of the Johansen technique will fail when the underlying regressors have different order of integration , especially when some of the variables are I(0) (Pesaran, et.al, 2001). That means the Trace and maximum Eigen value tests may lead to erroneous co-integrating relations with other variables in the model when *I*(0) variables are present in the system (Harris, 1999).

Fortunately, to overcome this problem a new Autoregressive Distributed Lag (ARDL) model **is** developed by Pasaran, Shin and Smith (2001) which have more advantages than the Johnson co-integration approach. *First,* the ARDL approach can be applied irrespective of whether the regressors are I(1) and I(0). *Second,* while the Johansen co-integration techniques require large data samples for validity, the ARDL procedure provides statistically significant result in small samples (Pesaran et al., 1999; Narayan, P., 2005; Udoh et.al, 2012). That means, it avoids the problem of biasness that arise from small sample size (Chaudhry et.al, 2006). *Third,* the ARDL procedure provides unbiased and valid estimates of the long run model even when some of the regressors are endogenous (Harris et.al, 2003, Pesaran et.al, 1999, Ang,J.,2007). Moreover, the ARDL procedure employs only a single reduced form equation, while the other co-integration procedures estimate the long-run relationships within a context of system equations. *Further*, in using the ARDL approach, a dummy variable can be included in the co-integration test process, which is not permitted in Johansen's method (Rahimi et.al, 2011). Therefore, in order to achieve the targeted objectives of the study, the model of economic growth equation is estimated using ARDL model of econometric technique.

4.3. Estimation procedure

4.3.1. Unit Root test

The ARDL approach to co-integration does not require the pre-testing of the variables, included in the model, for unit root unlike other techniques such as the Johansen approach (Pesaran *et al.*, 2001). However, Ouattara (2004) argues that in the presence of I(2) variables the computed F statistics provided by Pesaran *et al*. (2001) are no more valid because they are based on the assumption that the variables are I(0) or I(1); therefore, the implementation of unit root tests in the ARDL procedure might still be necessary in order to ensure that none of the variables is integrated of order two or beyond. Therefore, in order to determine the degree of stationarity, a unit root testing will be carried through the Augmented Dicky-Fuller (ADF) test and Philips–Perron test static of Philip (1987) and Philips and Perron (1988).

The simplest starting point for testing stationarity is an autoregressive model of order one, AR(1) and the DF test can be estimated on the following forms of AR(1) model as specified below (Gujrati, 2004).

$Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + u_t, where\ Y_t$ ……….. is a random walk with drift and trend.

Now subtracting Y_{t-1} from both sides of the equation will give us the following:

$$Y_t - Y_{t-1} = \delta Y_{t-1} - Y_{t-1} + u_t$$

$$\Delta Y_t = (\delta - 1)Y_{t-1} + u_t \text{……………………………………………… (6)}$$

Let $\delta - 1 = \emptyset$ and $u_t \sim IN(0, \sigma^2)$

The idea behind the Dickey-Fuller (DF) unit root test for stationarity is to simply regress ΔY_t on one period lagged value of $Y_t$and find out if the estimated $\emptyset$ is statistically equal to zero or less than zero. The hypothesis is given as follows:

H_0: $\emptyset = 0$, and H_1: $\emptyset < 0$

If $\emptyset = 0$ or $\delta = 1$ the equation will become a random walk without drift model, that is, a non-stationary process and we face what is known as the unit root problem. On the other hand, if $\emptyset < 0$ then the series Y_t will be a stationary variable.

Now, one can use the Dickey-Fuller (DF) critical values of the τ (tau) statistic for the unit roots and it is shown as follows to reject or not to reject the null hypothesis:

H_0: $\emptyset = 0$, and

H_1: $\emptyset < 0$

Then we can calculate the t- test statistics by using the following formula:

$$t_{stat} = \frac{estimated\ \emptyset}{Standard\ error\ of\ \emptyset}$$

Now we can compare the calculated test statistic in equation with the critical value from Dickey-Fuller table to reject or to accept the null hypothesis.

Calculating the critical values of the τ (tau) statistic requires the Dicky-Fuller assumption of the error terms(u_t) are not correlated (Enders, 1996). However, in the Dickey-Fuller test the error term usually has autocorrelation and if the result is to be valid it needs to be removed.

Furthermore, the critical values of τ (tau) statistics do not follow the normal distribution function and in general, the critical value is considerably larger than its counterpart of t- distribution.

Therefore as per Enders (1996), using such critical values can lead to over rejection of the null hypotheses when it is true. Because of this, Dickey and Fuller have developed a test which known as the **Augmented Dickey-Fuller (ADF) test** to solve this kind of difficulty (Green, 2004). In the ADF test, the lags of the first difference of dependent variable is added in the regression equation until the autocorrelation problem will be resolved and the regression equation can be presented as follows:

$$\Delta Y_t = \emptyset Y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta Y_{t-i} + u_t \text{.. (7)}$$

A random walk process may have no drift, or it may have drift; on the other hand it may have both deterministic and stochastic trend. Therefore we can write the model expressed in equation seven including an intercept (β_1) as well as a time trend(t) and we get:

$$\Delta Y_t = \beta_1 + \beta_2 T + \emptyset Y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta Y_{t-i} + u_t \text{................................. (8)}$$

β_2 , is the coefficient of a time trend series**,** $\emptyset$ is the coefficient of Y_{t-1} , p is the lag order of the autoregressive process and u_t is the white noise.

Then the parameter of interest in the ADF model is $\emptyset$ and the null and alternative hypotheses that will be tested are set as follows:

H_0: $\emptyset = 0$, and H_1: $\emptyset < 0$

Hence, in this study the researcher used the **Augmented Dickey-Fuller (ADF) test** of stationarity. In addition to this test, the Philips–Perron test stastic of Philip (1987) and Philips

and Perron (1988) is also conducted. **Philips and Perron test** corrects for any serial correlation and hetroschedasticity in the error terms (u_t) non-parametrically by modifying the Dicky-Fuller test.

After checking for the order of integration of all variables in the model, the Autoregressive Distributed Lag (ARDL) model involves two steps for estimating the long-run relationship (Pesaran et al., 2001). In the first step the existence of long-run relationship among all variables in an equation should be examined and then in the second step the long-run and short-run coefficients of the variables can be estimated in the model. One can run the second step only if we find along run co-integration relationship among the variables in the first step.

4.3.2. Diagnostic tests, Long run co-integration and the Error Correction Model

The simple generalized ARDL (p,q) model can be shown as follows (Green, 2003):

$$Y_{t=}C + \gamma T + \alpha_1 Y_{t-1} + \cdots + \alpha_p Y_{t-p} + \beta_0 X_t + \beta_1 X_{t-1} + \cdots + \beta_q X_{t-q} + \theta D + U_t \ldots\ldots\ldots\ldots (9)$$

Where $C, T, D,$ and U_t are intercept of the model, the time trend, dummy variable and white noise error term respectively. The above model is "autoregressive" since it includes p lags of the dependent variable and at the same time it is also a "distributed lag" model because it includes q number of lags of the explanatory variable.

Another critical step is to test the long run relationship between the variables through the Bound Testing approach which is first applied by Pesaran and Shin (1999) and Pesaran, Shin, and Smith (2001). After checking and estimating the long run relationship of the variables, then one can estimate the appropriate short run parameters by using Error Correction model (ECM).

Let us Assume ARDL (1, 1), then the above equation can be written as:

$$Y_t = \beta_0 X_t + \beta_1 X_{t-1} + \rho Y_{t-1} + U_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (10)$$

Subtracting Y_{t-1} from both sides of the model will give as the following equation:

$$\Delta Y_t = \beta_0 X_t + \beta_1 X_{t-1} + (\rho - 1) Y_{t-1} + U_t \ldots\ldots\ldots\ldots\ldots\ldots (11)$$

Let us $(1 - \rho) = \delta$ then we will get:

$$\Delta Y_t = \beta_0 X_t + \beta_1 X_{t-1} - \delta Y_{t-1} + U_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (12)$$

$\Delta X_t = X_t - X_{t-1}$ And $X_t = \Delta X_t + X_{t-1}$

Now substituting X_t in the above equation will give us:

$$\Delta Y_t = \beta_0 \Delta X_t + \beta_0 X_{t-1} + \beta_1 X_{t-1} - \delta Y_{t-1} + U_t$$

$$\Delta Y_t = \beta_0 \Delta X_t + (\beta_0 + \beta_1) X_{t-1} + \delta Y_{t-1} + U_t \ldots\ldots\ldots\ldots\ldots\ldots (13)$$

Let us assume$\beta_0 + \beta_1 = \varphi$, then

$$\Delta Y_t = \beta_0 \Delta X_t + \varphi X_{t-1} - \delta Y_{t-1} + U_t$$

$$\Delta Y_t = \beta_0 \Delta X_t + (\varphi X_{t-1} - \delta Y_{t-1}) + U_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (14)$$

Then multiplying the term$(\varphi X_{t-1} + \delta Y_{t-1})$ by $\frac{\delta}{\delta}$ will give the following:

$$\Delta Y_t = \beta_0 \Delta X_t - \delta (Y_{t-1} - \frac{\varphi}{\delta} X_{t-1}) + U_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (15)$$

Then we can write the error correction model as follows:

$$\Delta Y_t = \beta_0 \Delta X_t - \delta (Y_{t-1} - \alpha X_{t-1}) + U_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (16)$$

Where $\alpha = -(\frac{\varphi}{\delta}) = \frac{\beta_0 + \beta_1}{\delta}$ and $\delta = 1 - \rho$

Therefore the above equation (16) can be rewritten as:

$$\Delta Y_t = \beta_0 \Delta X_t - (1-\rho)(Y_{t-1} - \left(\frac{\beta_0 + \beta_1}{(1-\rho)}\right) X_{t-1}) + U_t$$

$$\Delta Y_t = \beta_0 \Delta X_t + \delta ECT_{t-1} + U_t \text{………………………….. (17)}$$

Where $\delta = (\rho - 1)$, is the error correcting parameter which measures the speed of adjustment of the model.

$(Y_{t-1} - \left(\frac{\beta_0+\beta_1}{(1-\rho)}\right) X_{t-1}) = ECT_{t-1}$, is the error correcting term lagged by one period.

Generally ARDL (p, q) model can now be expressed as an error correction model:

$$\Delta Y_t = \beta_0 \Delta X_t + \sum_{j=1}^{p-1} \theta_j^* \Delta Y_{t-j} + \sum_{j=1}^{q-1} \beta_j^* \Delta X_{t-j} + \delta ECT_{t-1} + \theta D + U_t \text{……………… (18)}$$

Where, $\theta_j^* = -\sum_{i=j+1}^{p} \theta j\,;\ j = 1, 2, \dots p-1$ and $\beta_j^* = -\sum_{i=j+1}^{q} \beta j;\ j = 1, 2, \dots q-1$

Then one can include a constant, a trend and dummy variables to the above model to obtain the final short run or error correction representation of ARDL (p, q) model. Therefore, the following ARDL approach is specified in order to determine or test the long-run co-integration relationships between variables which first proposed by Pesaran and Shin (1997, 1999) and Pesaran, Shin, and Smith (2001). In other word the following ARDL equation is the final equation to check for the long-run co-integration relationships between the variables of interest.

$$\Delta lnGDPpc_t = \beta_0 + \theta_1 lnGDPpc_{t-1} + \theta_2 lnK_{t-1} + \theta_3 lnLF_{t-1} + \theta_4 lnHK_{t-1} + \theta_5 lnPED_{t-1} + \theta_6 lnPEDS_{t-1} + \theta_7 lnTOp_t + \sum_{j=1}^{n} \beta_{1j} \Delta lnGDPpc_{t-j} + \sum_{j=1}^{n} \beta_{2j} \Delta lnK_{t-j} + \sum_{j=1}^{n} \beta_{3j} \Delta lnLF_{t-j} + \sum_{j=1}^{n} \beta_{4j} \Delta lnHK_{t-j} + \sum_{j=1}^{n} \beta_{5j} \Delta lnPED_{t-j} + \sum_{j=1}^{n} \beta_{6j} \Delta lnPEDS_{t-j} + \sum_{j=1}^{n} \beta_{7j} \Delta lnTOP_{t-j} + \beta_8 T + \beta_9 D + U_t \text{………………………………………………………………… (19)}$$

Where:

$\boldsymbol{lnGDPpc_t}$ = Natural logarithm of real GDP per capita at time t,

$\boldsymbol{lnK_t}$ = Natural logarithm of capital stock proxied by private capital formation as share of GDP at time t,

$\boldsymbol{lnLF_t}$ = Natural logarithm of labor Force as share of total population at time t,

$\boldsymbol{lnHK_t}$ =Natural logarithm of human Capital proxied by secondary, tertiary and vocational school enrolment as a share of population at time t,

$\boldsymbol{lnPED_t}$ =Natural logarithm of public external debt as a percentage GDP at time t,

$\boldsymbol{lnPEDS_t}$ = Natural logarithm of public external debt servicing as a percentage of export of goods and services at time t,

$\boldsymbol{lnTOP_t}$ =Natural logarithm of trade openness at time t,

$\boldsymbol{D}$ = Dummy variable for the policy change,

$\boldsymbol{U_t}$ = The usual white noise residuals,

$\boldsymbol{n}$, denotes lag length of the auto regressive process,

T, is the time trend of the model,

Δ, Denotes the first difference operator,

$\boldsymbol{\theta_1, \theta_2, \theta_3, \theta_4, \theta_5, \theta_6, \theta_7}$, are coefficients that measure long run relationships,

$\boldsymbol{\beta_{1j}, \beta_{2j}, \beta_{3j}, \beta_{4j}, \beta_{5j}, \beta_{6j}, \beta_{7j}}$, are coefficients that measure short run relationships.

Now to test whether there is a long run equilibrium relationship between the variables, the bounds test approach for co-integration is carried out as proposed by Pesaran and Shin (1999) and Pesaran, Shin, and Smith (2001). The hypotheses of the test are shown as follows:

H_0: $\boldsymbol{\theta_1 = \theta_2 = \theta_3 = \theta_4 = \theta_5 = \theta_6 = \theta_7 = 0}$ **,** means there is no long run relationship among the variables.

H_1**:** $\boldsymbol{\theta_1 \neq \theta_2 \neq \theta_3 \neq \theta_4 \neq \theta_5 \neq \theta_6 \neq \theta_7 \neq 0}$**,** means there is a long run relationship among the variables.

To test the above hypothesis the non-standard F-statistics can be used for which the critical values of the F-statistics are available in Pesaran, Shin, and Smith (2001). Additionally, Narayan (2005) also estimated the critical values by arguing that the critical values provided by Pesaran, Shin, and Smith (2001) are appropriate for relatively large sample sizes (n>500) and he said that using such critical values for small sample size may produce misleading results in the model. Hence, Narayan (2005) has generated a new set of critical values for small sample sizes (30<n<80) based on similar technique, GAUSS code[11] which was employed by Pesaran, Shin, and Smith (2001). They provide two sets of critical values which are the upper bound values and the lower bound values. Then to test the above hypothesis, we compare the computed F-statistics and the upper bound of the critical value. If the computed F-statistics is higher than the appropriate upper bound of the critical value, the null hypothesis of no co-integration among the variables can be rejected and the alternative hypothesis is accepted. But if it is below the appropriate lower bound, the null hypothesis cannot be rejected, and if it lies within the lower and upper bounds, the result would be inconclusive. Therefore, this paper used the computed F-statistics is compared with both critical values provided by Pesaran, Shin, and Smith (2001) and Narayan (2005). After checking and confirming the existence of long-run relationship among all the dependent and independent variables, the following stable long-run model can be estimated:

[11] GAUSS code is a programming language designed for matrix-based operations and manipulations, suitable for high level statistical and econometric computation.

$$lnGDPpc_t = \theta_0 + \theta_1 lnK_t + \theta_2 lnLF_t + \theta_3 lnHK_t + \theta_4 lnPED_t + \theta_5 lnPEDS_t + \theta_6 lnTOP_t + \theta_7 t + \theta_8 D + U_t \quad \ldots\ldots (20)$$

After checking the co- integration relationship among the variables and estimating the long run model, the next step is to estimate the short run dynamic parameters and the adjustment parameter that measure the speed of correction to long-run equilibrium after a short-run disturbance by using the vector error correction model. The standard error correction model can be estimated as follows:

$$\Delta lnGDPpc_t = \beta_0 + \sum_{j=0}^{n} \beta_{1j} \Delta lnK_{t-j} + \sum_{j=0}^{n} \beta_{3j} \Delta lnHK_{t-j} + \sum_{j=0}^{n} \beta_{2j} \Delta lnLF_{t-j} + \sum_{j=0}^{n} \beta_{4j} \Delta lnPED_{t-j} + \sum_{j=0}^{n} \beta_{5j} \Delta lnPEDS_{t-j} + \sum_{j=0}^{n} \beta_{6j} \Delta lnTOP_{t-j} + \beta_7 T + \beta_8 D + \delta ECT_{t-1} + U_t \quad \ldots\ldots (21)$$

$\boldsymbol{\beta_{1j}, \beta_{2j}, \beta_{3j}, \beta_{4j}, \beta_{5j}}$ ***and*** $\boldsymbol{\beta_{6j}}$ are Coefficients that represents the short run dynamics of the model,

$\boldsymbol{ECT_{t-1}}$, is error correction term lagged by one period,

$\boldsymbol{\delta}$, is error correction parameter that measure the speed of adjustment towards the long run equilibrium after a short-run disturbance.

The error correction term (ECT) is derived from the corresponding long run model whose coefficients are obtained by normalizing the equation. Another critical test in ARDL modeling is diagnostic tests on the over ARDL model. These tests are functional form test, normality test, serial correlation test, heteroscedasticity test and cumulative sum of recursive residuals

(CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) test are undertaken for checking the robustness and stability of the model.

4.3.3. **Causality test**

A granger causality test is made to the selected ARDL model to identify the direction of causality between the dependent variable real GDP per capita and the independent variables. That is a pair wise granger causality test is applied on the selected model to know the direction of causality of real GDP per capita with stock of public external debt and public external debt servicing. In order to estimate the above three specified equations (models) and to perform the pre estimation and post estimation diagnostic tests *Eviews9* and *Microfit 4.1*statistical packages are used.

CHAPTER FIVE

5. Results and Discussion

5.1. Unit Root test

Testing for existence of unit roots is of major interest in the study of time series models and co-integration. The presence of a unit root implies that the time series under investigation is non-stationary while the absence of a unit root shows that the stochastic process is stationary. Thus we have performed the tests for examining the stationary of the data. But in the ARDL model, the presence of I(2) variables are no more valid because they are based on the assumption that the variables are I(0) or I(1). Therefore, the implementation of unit root test in the ARDL procedure is necessary in order to ensure that none of the variables are integrated of order two or beyond. The standard Augmented Dicky-Fuller (ADF) and Philips-Perron unit root (PP) tests are conducted to check the order of integration of the variables. These tests are undertaken for three alternative specifications: with a constant but no trend, with both constant and trend and without trend and constant (See Table 5.1).

Table 5.1: Augmented Dicky-Fuller (ADF) unit root testing:

Variables	ADF t statistics in level			ADF t statistics in first difference	
	With intercept	With intercept and trend	None	Intercept	With intercept and trend
lnGDPpc	-0.420920	-0.622816	0.779300	-3.254293**	-3.689823**
lnHK	0.468379	-1.155749	2.613124	-3.795970***	-3.827298**
lnK	-2.680330*	-2.645428	0.066612	-6.438235	-6.388813
lnLF	0.918752	-1.146056	15.58772	-4.849892***	-4.910742***
lnPED	-1.350946	-1.978458	-0.099875	-4.414721***	-4.316007***
lnPEDs	-1.725105	-2.755501	-0.279617	-7.170075***	-7.060232***
lnTOP	-0.925436	-1.958286	0.714151	-6.208911***	-6.102463***

MacKinnon (1996) Critical Values The critical values	With intercept	With intercept & trend	None
1%	-3.653730	-4.273277	-2.639210
5%	-2.957110	-3.557759	-1.951687
10%	-2.617434	-3.212361	-1.610579

Note: ***, ** and * indicate the rejection of a null hypothesis of non stationary at 1%, 5% and 10% level of significance, respectively. Akaike information criterion (AIC) is used to determine the lag length.

Source: Output from Eviews 9.0

The rejection of the null hypothesis (that is there is a unit root) is based on ADF critical values. The results from the ADF unit root test show that one variable (K) is stationary in level and the remaining variables are stationary in their first difference; with intercept and/or intercept and trend. In other words there is no variable that is stationary in second difference and such result of the ADF unit root test is one justification for using the ARDL approach (bounds test approach of co-integration) developed by Pesaran, Shin, and Smith (2001).

Table 5.2: Philips- Perron (PP) unit root testing:

	PP test statistics in level			PP test statistics in first difference	
	With intercept	With intercept and trend	None	With Intercept	With intercept and trend
lnGDPpc	-0.084693	-0.124177	0.940780	-3.200635**	-3.602363**
lnHK	0.075560	-1.429895	1.888325	-3.788217***	-3.826537**
lnK	-2.673000*	-2.643568	0.309278	-6.675660	-6.621648
lnLF	0.905489	-1.146056	14.84684	-4.855804***	-4.869499***
lnPED	-1.617816	-2.341801	-0.140011	-4.423967***	-4.330737***
lnPEDS	-1.651022	-2.755501	-0.231163	-7.170075***	-7.060232***
lnTOP	-0.932707	-1.942934	0.780516	-6.192654***	-6.089668***

Note: ***, ** and * indicate the rejection of a null hypothesis of non stationary at 1%, 5% and 10% level of significance, respectively.

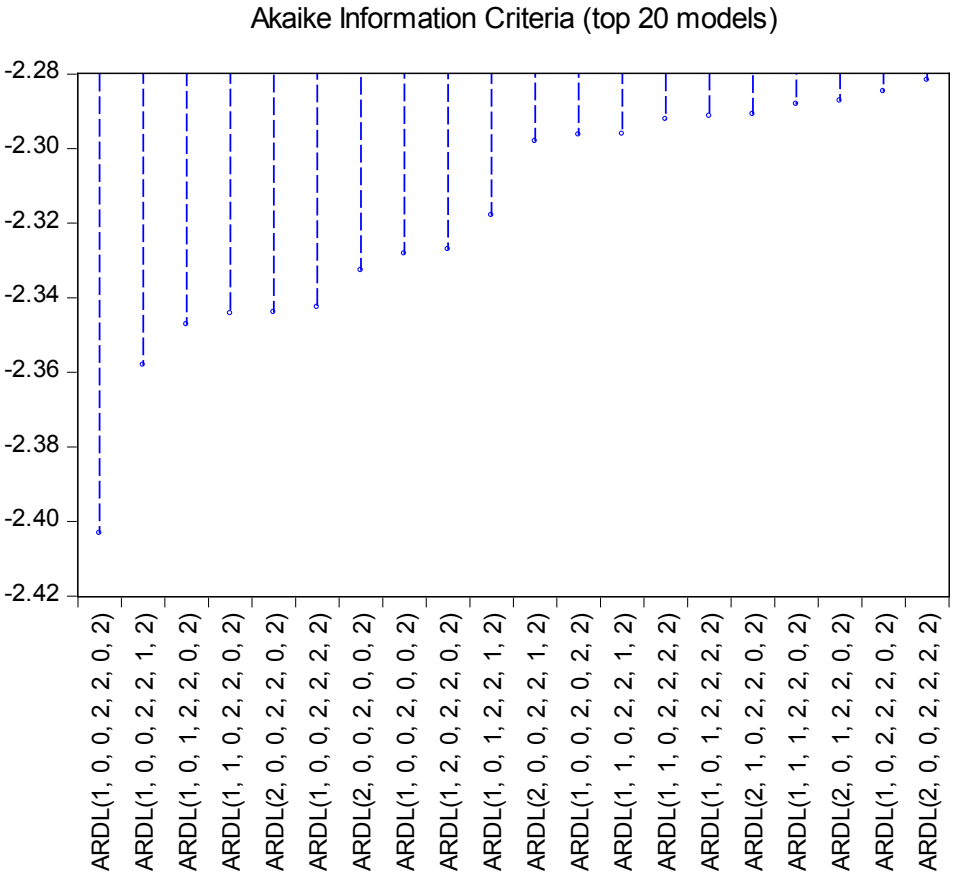
Source: Output from Eviews 9.0

Philips- Perron (PP) unit root test also shows, like that of ADF table result one variable (K) is stationary in level and the remaining variables are stationary in their first difference; with intercept and/or intercept and trend. Thus, both tests revealed that, the model is a mixture of variables that are integrated of order one and zero i.e. I(1) and I(0), none of the variables are found to be integrated of order two. Therefore, ARDL or bound testing approach to co-integration is the preferred and appropriate method of regression in this case.

5.2. Diagnostic testing and model stability

In this study Akaike information criterion (AIC) is used to determine the optimal lag length of each variable automatically because it is a better choice for small sample size data. Moreover, according to Pesaran and Shin (1999), for the annual data a maximum of two lag length is recommended to choose the optimal lag for each variable. Therefore, in this paper a maximum lag length of 2 was chosen for the conditional ARDL model. Finally, in this model, AIC selects the optimal lag length of each variable (lnGDPpc, lnHK, lnK, lnLF, lnPED, lnPEDS, lnTOP), respectively and it is ARDL (1, 0, 0, 2, 2, 0, 2). This automatical determination of the lag length is to get the valid result and inferences.

Figure 5.1: Optimal lag length for each variable (top 20 models)



Source: Output from Eviews 9.0

To check the reliability and verifiability of the estimated long-run and short-run models, diagnostic tests are undertaken. These tests include serial correlation (Brush and Godfray LM test), Functional form (Ramsey's RESET test), Normality (Jaque-Bera test), Hetroscedasticity (Breusch-Pagan-Godfrey test) and also CUMSUM recursive residuals and CUMSUM square recursive residuals tests are applied to check the overall stability of the long-run and short-run coefficients which are recommended by Pesaran et al. (2001). Table 5.3 presents the results.

Table 5.3: Diagnostic tests for the selected full ARDL (1, 0, 0, 2, 2, 0, 2) model- selected based on Akaike information criteria:

Test statistics	LM version	F version
Serial Correlation	CHSQ(1)= 1.2024[.273]**	F(1, 13)= .62469[.441]**
Functional Form	CHSQ(1)= .011370[.915]**	F(1, 15)= .0053317[.943]**
Normality	CHSQ(2)= 1.5745[.455]**	Not applicable
Heteroscedasticity	CHSQ(1)= 1.3321[.248]**	F(1, 30)= 1.3031[.263]**

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

Note: The sign ** indicates the significance of each diagnostic tests or the acceptance of the null for each test at 5% level of significance.

Source: Microfit 4.1 ARDL (1, 0, 0, 2, 2, 0, 2) result.

The results indicate that both the LM version and the F version of the statistics are unable to reject the null hypothesis specified for each test. Hence, there is no serial correlation problem

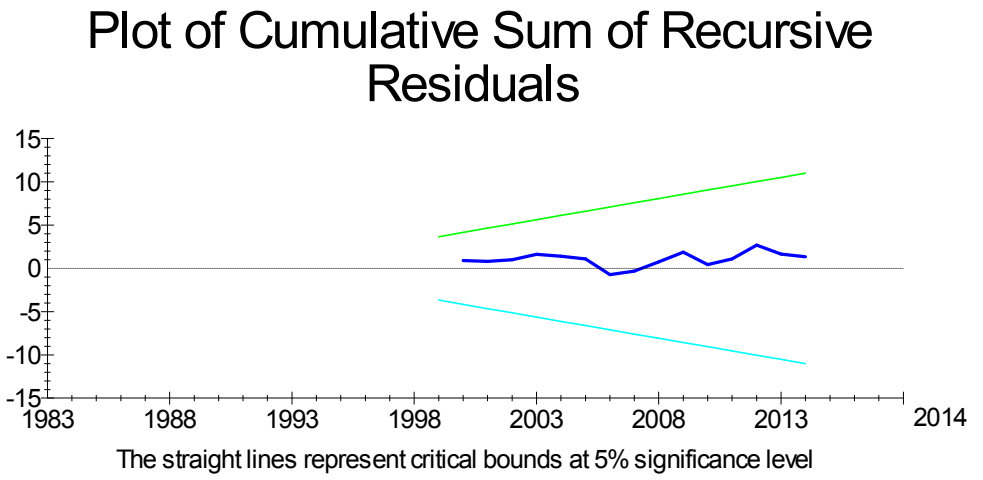
and the Ramsey functional form test confirms that the model is specified well. Likewise the errors are normally distributed and the model doesn't suffer from heteroskedasticity problem.

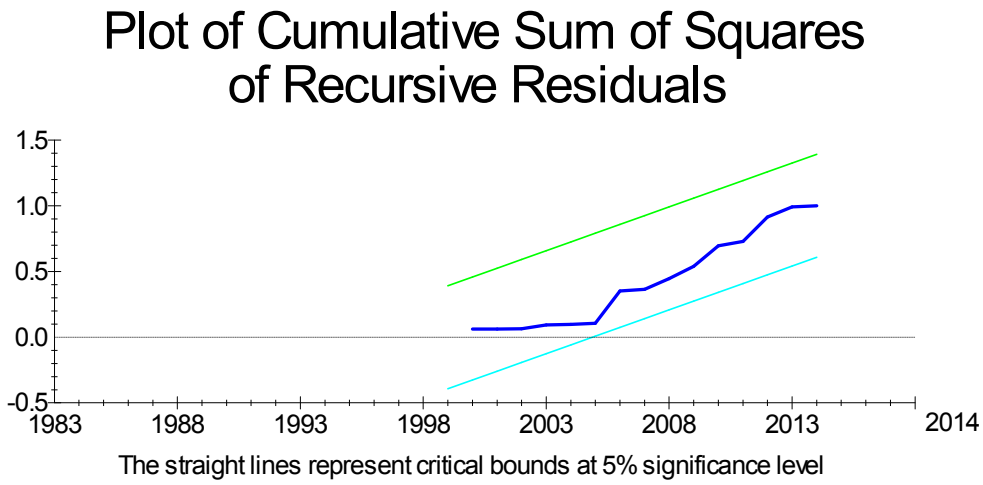
a) The null hypothesis of no serial correlation (Brush and Godfray LM test) is failed to reject for the reason that that the p-value associated with test statistic is greater than the standard significant level (0.273> 0.05). Since the lagged dependent variable appear as a regressor in the model, LM test avoid the use of the traditional Durbin Watson test statistic.
b) For Ramsey's RESET test, which tests whether the model suffers from omitted variable bias or not we failed to reject the null hypothesis of this test which says that the model is correctly specified, because the p-value is larger than the conventional significance value (0.915> 0.05).
c) Similarly, we could not reject the null hypothesis for the Jaque-Berra normality test which says that the residuals are normally distributed, for the reason that the p-value associated is larger than the standard significance level (0.455>0.05). Therefore the error term is normally distributed.
d) The last diagnostic test is hetroscedasticity test and as we can understand from the result, the null hypothesis of no heteroscedasticity is failed to be rejected at 5% significant level due to its p-value associated is greater than the standard significance level (0.248> 0.05).

The stability of the model for the long run and short run relationships is detected using the scenario CUSUM and CUSUM square test as suggested by Pesearon and shin (1997). The test statistics of these stability tests can be graphed and hence we can identify not only their significance but also at what point of time a possible instability or structural break is occurred. If

the plot of CUSUM recursive residual and CUSUMSQ recursive residual statistic moves between the critical bounds at 5% significance level, then the estimated coefficients are said to be stable and efficient.

Figure 5.2: Plot of CUSUM and CUSUMSQ tests





Source: Microfit 4.1 ARDL (1, 0, 0, 2, 2, 0, 2) result.

Therefore, the plot of CUSUM recursive residual and CUSUMSQ recursive residual shows that there is no structural instability in the model during the period under investigation. From this, the model appears to be stable and efficient in estimating short run and long run relationship between the dependent variable and the included explanatory variables.

5.3. Tests for Long Run Relationship (Bound testing approach to co-integration)

To apply the bounds test approach of co-integration, first estimating the ARDL model specified is needed. Then the value of F-statistics is found through the Wald-test by restricting the long run equation coefficients to be equal to zero. That is, the Wald test is conducted by imposing restrictions on the estimated long-run coefficients of variables of interest. Then, the computed F-statistic value is compared with the lower bound and upper bound critical values tabulated in tables of Pesaran, Shin, and Smith (2001) and Narayan (2005). Since, the lower bound and upper bound values of Narayan (2005) is appropriate for small sample sizes (30-80 observations), in this study these upper and lower bound critical values are used for scenario of comparison with the F-statistic value.

Table 5.4: Bound test for co-integration analysis:

Description	Values
Number of observations	34
Optimal lag length of the model	2
Calculated F- statistics	4.964699

Source: EVIEWS 9 and Microfit 4.1 ARDL (1, 0, 0, 2, 2, 0, 2) result.

Table 5.5: The critical values for bound test with unrestricted intercept and trend:

Description	At 1% level		At 5% level		At 10% level	
	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound
Pasaran et al.(2001) critical Values	3.60	4.90	2.87	4.00	2.53	3.59
Naryan(2005) Critical Values	3.800	5.643	2.797	4.211	2.353	3.599

Source: Pesaran, Shin, and Smith (2001) and Narayan (2005) tables.

As Table 5.4 indicates, the calculated F-statistics is 4.97 and this value is higher than the upper bound critical values at 5% level of significance (see Table 5.5). The results indicate that there is strong evidence of long-run relationship or co-integration between log of GDP per capita and the remaining macro variables. This represents a co-integrated GDP per capita equation in Ethiopia. Thus, the null hypothesis of no co-integration between GDP per capita and its fundamentals is rejected.

5.4. Dynamic long-run ARDL estimates

Once we confirmed the long run relationship for the GDP per capita equation in Ethiopia; that is after confirming the existence of a long-run relationship among log of GDP per capita, log of human capital, log of private capital formation, log of stock of public external debt, log of public external debt servicing and log of trade openness, the next critical step is estimating the long-run coefficients of log of GDP per capita (lnGDPpc) on its regressors. The results are reported in Table 5.6.

Table 5.6: Estimated long run coefficients for the selected Long run ARDL (1, 0, 0, 2, 2, 0, 2) model- selected based on Akaike information criteria:

Dependent variable is lnGDPpc				
Regressors	Coefficients	ST. Error	T-Ratio	Prob. Value
lnHK	-0.45923	0.17379	-2.6424	0.0180**
lnK	0.010504	0.082456	0.12739	0.900
lnLF	16.4727	2.7575	5.9738	0.000***
lnPED	-0.20542	0.093220	-2.2036	0.043**
lnPEDs	0.059752	0.066283	0.90147	0.381
lnTOP	0.16399	0.21502	0.76265	0.457
Policy change dummy (D)	0.44018	0.12420	3.5441	0.003***
Constant (C)	-56.7286	10.4269	-5.4406	0.000***
Trend (t)	0.035743	0.014184	2.5199	0.023**

Note: The signs ***, ** and * indicate the significance of the coefficients at 1%, 5% and 10% level of significance respectively.

Source: Microfit 4.1 ARDL (1, 0, 0, 2, 2, 0, 2) regression result

The GDP per capita equation or growth model is specified in a log-linear form; hence, the coefficient of the dependent variable can be interpreted as elasticity with respect to economic growth. As we observe from the long-run ARDL regression result (see Table 5.6), log of stock of public external debt has a significant negative impact on log of GDP per capita and a 1 percent increase in the stock of public external debt, holding other things constant, leads to a 0.205 percentage decline in GDP per capita. This significant negative impact of public external debt on economic growth implies that, the greater the level of stock of public external debt, the more the

economic growth worsens. This result partly reflects the use of public external borrowing (except capital linked loans) on non-productive activities and sectors and this is consistent with the literature. Moreover, a significant portion of public external debt proceeds to repay other past external debts rather than to boost capital investment in domestic. This result support also the finding that high public external debt levels are associated with low growth as a higher tax burden on capital is required to service this stock of public external debt, leading to a lower rate of return on capital and hence lower investment, dead weight loss and lower economic growth. Therefore the result reveals that the "debt overhang" theory and the "conventional view" of public external debt holds true for Ethiopia. It is inconsistent with the findings of studies made by Rahman (2012) for Malaysian economy, Okechukwu and Anele (2012) for Nigeria's economy, Al-Zeaud (2014) for Jordanian economy, Uzun, et al., (2012) for transition economies. But it is consistent with the results specifically those related to developing countries such as a study made by Peng Lee and Ling Ng (2015) for Malaysian economy, Shabbir and Yasin (2015) for developing countries, Kumar and Woo (2010) for advance and emerging economies.

On the other hand, there is no evidence to support the theory of a long-run "crowding-out" effect of public external debt since the coefficient of log of public external debt servicing is insignificant in explaining log of GDP per capita in Ethiopia (see Table 5.6). The result reveals that public external debt servicing, that is fraction of the scarce resources which is transferred to foreign public debt payment, does not affect the development spending and hence economic growth in Ethiopia. It is inconsistent with a study made by Shah and Pervin (2012) for Bangladish economy. Another variable employed in explaining the economic growth equation is labor force (which is proxied by labor force as a share total population). In the long run log of labor force brought a very significant positive impact on log of GDP per capita. Holding other

things constant, a 1 percent increase in labor force leads a 16.4 percent increase in GDP per capita. This result supports the theory that an expansion and utilization of labor force is important in production.

The surprising result of this study is that log of human capital has a significant negative impact on log of GDP per capita of Ethiopia in the long-run. According to Romer (1996), human capital accumulation that is the ability of individuals to solve problems and to think critically is believed to promote higher growth. However, in this study this theory does not hold true and a 1 percent increase in human capital (proxied by secondary, vocational and tertiary school enrolment as a share of total population), leads to 0.459 percent decline in GDP per capita. This happens may be due to the fact that the quality of education, that is the government of Ethiopia is showing a strong commitment to expand the number/coverage of educational institutions in the country rather than giving attention for its quality.

Moreover, the dummy variable for policy change (D) and the time trend (T) are found to be significant in affecting economic growth (GDP per capita) in Ethiopia. Other things remain constant, a policy change from Derg regime to post Derg regime leads to a 0.44 percent increase in GDP per capita of the country. This result is consistent with the descriptive analysis and it is due to structural adjustment policies, relatively favorable political condition, departure from the previous socialist system and good economic performance over the regime. On the other hand, a time trend also has a positive significant impact on the economy and a 1 year change of the time trend also causes real GDP per capita to increase by a 0.036 percent. But, Private investment and trade openness are found to be insignificant in the model.

5.5. Dynamic short run error correction estimates

Table 5.7: The short run error correction representation for the selected ARDL (1, 0, 0, 2, 2, 0, 2) model selected based on Akaike Information Criterion:

Dependent variable is DlnGDPpc				
Regressors	Coefficients	ST. Error	T-Ratio	Prob. Value
DlnHK	-0.31515	0.14656	-2.1503	0.045**
DlnK	0.0072085	0.056604	0.12735	0.900
DlnLF	3.5935	6.7731	.53056	0.602
DlnLF1	-15.0003	6.2079	-2.4163	0.026**
DlnPED	-.090976	0.072328	-1.2578	0.224
DlnPED1	0.10367	0.055576	1.8653	0.078
DlnPEDs	0.041005	0.048714	0.84175	0.410
DlnTOP	-0.31480	0.12467	-2.5251	0.021**
DlnTOP1	-0.42860	0.13076	-3.2778	0.004***
DPolicy change dummy (dD)	0.30207	0.098611	3.0633	0.006***
DConstant (dC)	-38.9306	8.7405	-4.4541	0.000***
DTrend (dt)	0.024529	0.012366	1.9836	0.062
ECM	-0.68626	0.14430	-4.7557	0.000***
R-Squared 0.89557			R-Bar-Squared 0.79767	
F-stat. F(12,19) 11.4346[.000]			DW-statistic 2.6601	

Note: The signs ***, ** and * indicate the significance of the coefficients at 1%, 5% and 10% level of significance respectively.

Source: Microfit 4.1 ARDL (1, 0, 0, 2, 2, 0, 2) regression result.

The short-run ARDL estimate above indicates that, unlike that of the long-run analysis, stock of public external debt (DlnPED) is insignificant and it does not have an impact on economic growth (GDP per capita). This short-run finding is consistent with the study made by Shah and Pervin (2012) for Bangladish economy. Similarly, from the daynamic short-run result we

observed that, public external debt servicing (DlnPEDs) is insignificant and it has not observable effect in economic growth in Ethiopia. This short-run result of log of public external debt servicing is the same and consistent with the result in the long-run analysis.

In the short-run, both the coefficients of trade openness (DlnTOP) and human capital (DlnHK) indicate a negative significant effect on economic growth. This negative coefficient of openness indicates when it is changed positively by 1 percent point, economic growth (DlnGDPpc) decline by 0.31 percent which suggests that openness can be pain for an economy and invoke a call for protectionism. This may arise in line with poor quality of institutions and weak exporting capacity of the country or large share of import content of the countries international trade participation. The short run coefficient of human capital also has a significant negative impact on economic growth. Holding other things constant, a 1 percent increase in human capital leads to a 0.32 percent decline in GDP per capita of the country. This short-run result is consistent with its long-run effect on economic growth in Ethiopia.

The speed of adjustment of any disequilibrium towards long-run equilibrium or the equilibrium error correction coefficient (ECM), estimated (-0.68626) is highly significant and has the correct sign. It implies a very high speed of adjustment to equilibrium after a shock. Approximately 68.62 percent of the disequilibrium from the previous year's shock converges back to the long-run equilibrium in the current year and such highly significant error correction term is another proof for the existence of a stable a long-run equilibrium relationship among the variables. The dummy variable for policy change (dD) is significant in the short run also. But private investment (dK) and time trend (dT) are insignificant in explaining economic growth in the short-run.

5.6. The pair Wise Granger causality Results

To identify the direction of causality between the dependent variable (lnGDPpc) and the targeted independent variables stock of public external debt (lnPED) and public external debt servicing (lnPEDs), a granger causality test is undertaken (see Table-5.8). The result revealed that, at lag length of one, there is significant unidirectional causality between real GDP per capita and stock of public external debt (proxied by the stock of public external debt as a share of GDP) and public external debt servicing (proxied by public external debt servicing as a share of export of goods and services).

Table 5.8: Pair wise granger causality test for the selected ARDL (1, 0, 0, 2, 2, 0, 2) model-selected based on Akaike Information Criterion:

Null Hypothesis	Lag length 1		Lag length 2	
	F-stat	Prob. Value	F-stat	Prob. Value
lnPED does not granger cause lnGDPpc	11.0076	0.0024***	2.47206	0.1033
lnGDPpc does not granger cause lnPED	2.24566	0.1444	1.50135	0.2408
lnPEDs does not granger cause lnGDPpc	6.14426	0.0190**	3.80894	0.0349**
lnGDPpc does not granger cause lnPEDs	1.13857	0.2945	1.55741	0.2290

Note: The signs ***, ** and * indicate the significance of the coefficients at 1%, 5% and 10% level of significance respectively.

Source: Output from Eviews 9

There is a unidirectional causal relationship from stock of public external debt to GDP per capita at lag length one and this is consistent with the long-run regression result. There is also a unidirectional causal relationship from public external debt servicing to real GDP per capita at

both lag length one and two. The uni-directional relationship between GDP per capita and stock of public external debt implies that stock of public external debt causes only for GDP per capita change and real GDP per capita doesn't cause stock of public external debt to change. This is inconsistent with the finding of study by Apere (2014) for the Nigeria's economy but it is consistent with Korkmaz (2015) for Turkish economy.

On the other hand, the unidirectional relationship between GDP per capita and public external debt servicing implies that public external debt servicing causes only for GDP per capita change but GDP per capita cannot cause public external debt servicing to change. Therefore, there is a uni-directional causal relationship from public external debt to GDP per capita in Ethiopia.

CHAPTER SIX

6. Conclusion and Implications

6.1. Conclusion

Ethiopia is being a developing country and compliments its revenue through exports of primary commodities. In attempting to add on the available domestic resources, successive governments have acquired huge amount of external debt which is used to finance the national development projects. Therefore, the main objective of this study is to investigate the impact of public external debt on economic growth of Ethiopia by proxy the debt burden into public external debt and public external debt servicing. The major contribution of this study is that, unlike other researchers who consider external debt at an aggregate level, this study looks the separate impact of the government or public external debt. It is known that the aggregate external debt is composed of private and public external debt. The study probes whether the conventional view or Ricardian equivalence theory holds for Ethiopia and if public external debt adversely affects the economy; the study also announced the existence or absence of debt overhang and crowding out effect of public external debt. To specify the debt overhang and crowding out effect of public external debt the debt burden has been segmented into two part; public external debt stock and public external debt servicing.

To accomplish the objective of this study, the autoregressive distributive lag (ARDL) modeling approach to co-integration and the error correction model (ECM) have been employed for the period from 1981 up to 2014. Based on the econometric analysis and findings of the study, the following conclusions are derived.

The long-run coefficient of stock of public external debt variable is negative and quite significant which indicate that, high level of public external debt stock in Ethiopia poses great challenges on

the economy of the country. Because it is used for non-productive activities and the funds are not always channeled to the real productive sectors. Moreover, a significant portion of public external debt proceeds to repay other debts rather than to boost capital investment in the country and higher tax burden on capital is required to service this stock of public external debt, leading to a lower rate of return on capital, and hence lower investment and economic growth. Generally, this means the conventional view of public external debt holds true and any increase in stock of public external debt would worsen economic growth in Ethiopia. Therefore, it is better to reduce the stock of public external debt in the country. But the long-run impact of stock of public external debt servicing is insignificant indicating it is not a threat for economic growth in Ethiopia which implies there is no evidence for crowding out effect public external debt to occur.

Moreover, human capital (proxied by secondary, vocational and tertiary school enrolment as a share of total population) has a significant negative impact on GDP per capita. This happens may be due to the fact that the quality of education, that is the government of Ethiopia is showing a strong commitment to expand the number/coverage of educational institutions in the country rather than giving attention for its quality. Despite expansion of education, the sector is not delivering economic growth because these institutions don't have the capacity to drive the development agenda and innovation. Labor force brought a significant positive impact on GDP per capita. This result supports the theory that an expansion and utilization of labor force is important in production.

The short-run dynamic ARDL regression result also reveals that, the speed of adjustment of any disequilibrium towards long-run equilibrium or the equilibrium error correction coefficient estimated (-0.68626) is highly significant suggesting about 68.62 percent annual adjustment towards long run equilibrium. It implies a very high speed of adjustment to equilibrium after a

shock. Furthermore, apart from the long-run and short-run regression results, the causality test result indicates that there is a significant a uni-directional causal relationship from public external debt to real GDP per capita in Ethiopia.

6.2. Implications

From our major findings, we found the overwhelming negative impact of stock of public external debt on economic growth of Ethiopia. This increasing public external debt stock may lead the country towards high debt ratio regimes associated with lower economic growth.

- ✓ Since the dependence on external resource is both risky and unreliable, the government needs to mobilize its own resource and need to pursue policies geared towards reducing its exposure to external debt stock in order to reduce its adverse effects on the economy. That is, to avoid more loans build-upping, the government should diversify the economy so as to generate more revenue and need to increase financing from the domestic market.
- ✓ The government and policy makers should expeditiously seek to implement structural reforms geared towards public sector reform and public external debt sustainability.
- ✓ There is a need for the government and policy makers to know the threshold level of public external debt. Because reasonable borrowing can enhance economic growth, both through capital accumulation and productivity growth.
- ✓ The government should pay more attention to the debt management profile particularly in its expenditure. Borrowed funds should be tied to productive ventures and invested in self liquidating developmental projects investing including basic infrastructural developments that facilitate the productivity of other sectors of the economy rather than for social consumption.

- ✓ Regarding human capital, the government should not only stress for expanding education but also it is better to give a large commitment for the quality of education, should create favorable environment for research and innovation, should consider issues such as curriculum reforms, infrastructure and material development, better and qualified teachers with enough laboratories and research centers.

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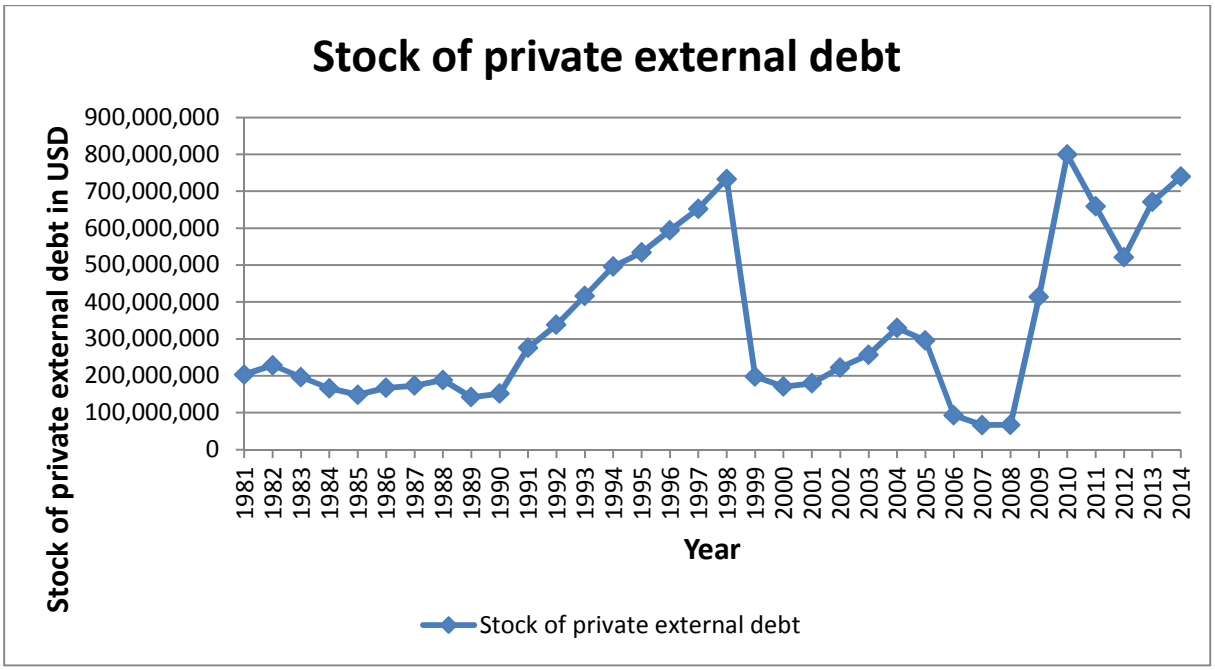
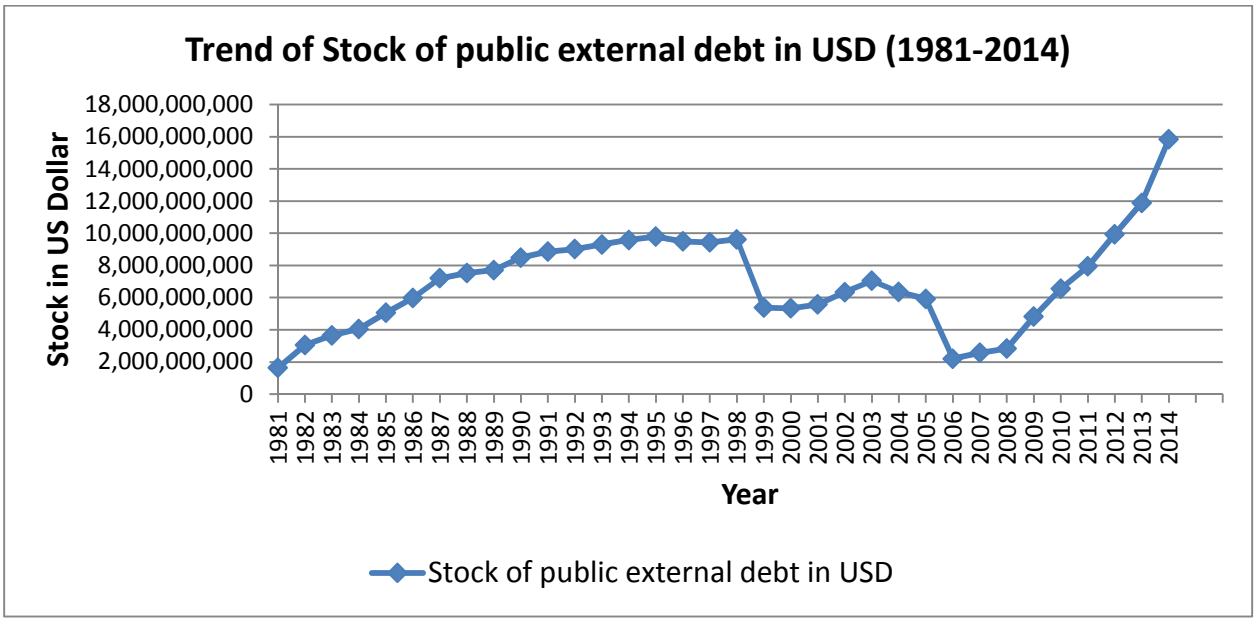
Appendices

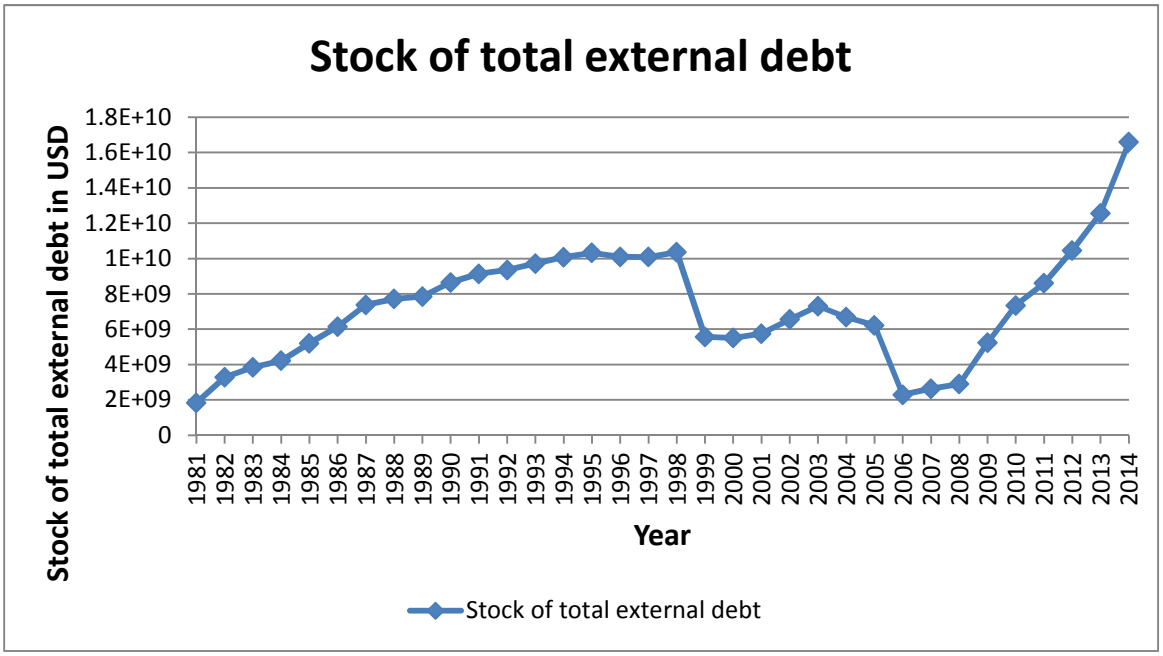
Appendix 1: The stock of private external debt of Ethiopia in USD (from 1981 to 2014)



Appendix 2: The stock of public external debt of Ethiopia in USD (from 1981 to 2014)



Appendix 2: The stock of Total external debt of Ethiopia in USD (from 1981 to 2014)



Appendix 3:

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       Autoregressive Distributed Lag Estimates
     ARDL(1,0,0,2,2,0,2) selected based on Akaike Information Criterion
*******************************************************************************
 Dependent variable is LNGDPPC
 32 observations used for estimation from 1983 to 2014
*******************************************************************************
 Regressor             Coefficient       Standard Error         T-Ratio[Prob]
 LNGDPPC(-1)               .31374            .14430             2.1742[.045]
 LNHK                     -.31515            .14656            -2.1503[.047]
 LNK                     .0072085           .056604             .12735[.900]
 LNLF                      3.5935            6.7731             .53056[.603]
 LNLF(-1)                 -7.2893           11.2410            -.64846[.526]
 LNLF(-2)                 15.0003            6.2079             2.4163[.028]
 LNPED                   -.090976           .072328            -1.2578[.227]
 LNPED(-1)                .053669           .079650             .67381[.510]
 LNPED(-2)                -.10367           .055576            -1.8653[.081]
 LNPEDS                   .041005           .048714             .84175[.412]
 LNTOP                    -.31480            .12467            -2.5251[.023]
 LNTOP(-1)               -.0012602           .12090           -.010423[.992]
 LNTOP(-2)                 .42860            .13076             3.2778[.005]
 D                         .30207           .098611             3.0633[.007]
 INPT                    -38.9306            8.7405            -4.4541[.000]
 TREND                    .024529           .012366             1.9836[.065]
*******************************************************************************
 R-Squared                    .99064   R-Bar-Squared                    .98187
 S.E. of Regression          .062415   F-stat.    F( 15,  16)  112.9403[.000]
 Mean of Dependent Variable   5.3464   S.D. of Dependent Variable      .46357
 Residual Sum of Squares     .062330   Equation Log-likelihood        54.4508
 Akaike Info. Criterion      38.4508   Schwarz Bayesian Criterion     26.7249
 DW-statistic                 2.6601   Durbin's h-statistic     -3.2322[.001]
*******************************************************************************


                            Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=   1.2024[.273]*F(   1,  15)=   .62469[.441]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=  .011370[.915]*F(   1,  15)= .0053317[.943]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   1.5745[.455]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   1.3321[.248]*F(   1,  30)=   1.3031[.263]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

Appendix 4:

ARDL Bounds Test

Sample: 1983 2014
Included observations: 32
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-statistic	4.964699	6

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.53	3.59
5%	2.87	4
2.5%	3.19	4.38
1%	3.6	4.9

Appendix 5:

Estimated Long Run Coefficients using the ARDL Approach
ARDL(1,0,0,2,2,0,2) selected based on Akaike Information Criterion

Dependent variable is LNGDPPC
32 observations used for estimation from 1983 to 2014

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
LNHK	-.45923	.17379	-2.6424[.018]
LNK	.010504	.082456	.12739[.900]
LNLF	16.4727	2.7575	5.9738[.000]
LNPED	-.20542	.093220	-2.2036[.043]
LNPEDS	.059752	.066283	.90147[.381]
LNTOP	.16399	.21502	.76265[.457]
D	.44018	.12420	3.5441[.003]
INPT	-56.7286	10.4269	-5.4406[.000]
TREND	.035743	.014184	2.5199[.023]

Appendix 6:

```
        Error Correction Representation for the Selected ARDL Model
     ARDL(1,0,0,2,2,0,2) selected based on Akaike Information Criterion
********************************************************************************
 Dependent variable is dLNGDPPC
 32 observations used for estimation from 1983 to 2014
********************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 dLNHK                     -.31515            .14656            -2.1503[.045]
 dLNK                     .0072085           .056604             .12735[.900]
 dLNLF                     3.5935            6.7731             .53056[.602]
 dLNLF1                   -15.0003            6.2079            -2.4163[.026]
 dLNPED                   -.090976           .072328            -1.2578[.224]
 dLNPED1                   .10367            .055576             1.8653[.078]
 dLNPEDS                   .041005           .048714             .84175[.410]
 dLNTOP                    -.31480            .12467            -2.5251[.021]
 dLNTOP1                   -.42860            .13076            -3.2778[.004]
 dD                         .30207           .098611             3.0633[.006]
 dINPT                    -38.9306            8.7405            -4.4541[.000]
 dTREND                    .024529           .012366             1.9836[.062]
 ecm(-1)                   -.68626            .14430            -4.7557[.000]
********************************************************************************
 List of additional temporary variables created:
 dLNGDPPC = LNGDPPC-LNGDPPC(-1)
 dLNHK = LNHK-LNHK(-1)
 dLNK = LNK-LNK(-1)
 dLNLF = LNLF-LNLF(-1)
 dLNLF1 = LNLF(-1)-LNLF(-2)
 dLNPED = LNPED-LNPED(-1)
 dLNPED1 = LNPED(-1)-LNPED(-2)
 dLNPEDS = LNPEDS-LNPEDS(-1)
 dLNTOP = LNTOP-LNTOP(-1)
 dLNTOP1 = LNTOP(-1)-LNTOP(-2)
 dD = D-D(-1)
 dINPT = INPT-INPT(-1)
 dTREND = TREND-TREND(-1)
 ecm = LNGDPPC +   .45923*LNHK  -.010504*LNK  -16.4727*LNLF +   .20542*LNPED
 -.059752*LNPEDS   -.16399*LNTOP -   .44018*D +  56.7286*INPT  -.035743*TREND
********************************************************************************
 R-Squared                      .89557   R-Bar-Squared                   .79767
 S.E. of Regression            .062415   F-stat.    F( 12,  19)   11.4346[.000]
 Mean of Dependent Variable    .031743   S.D. of Dependent Variable      .13876
 Residual Sum of Squares       .062330   Equation Log-likelihood        54.4508
 Akaike Info. Criterion        38.4508   Schwarz Bayesian Criterion     26.7249
 DW-statistic                   2.6601
********************************************************************************
 R-Squared and R-Bar-Squared measures refer to the dependent variable
 dLNGDPPC and in cases where the error correction model is highly
 restricted, these measures could become negative.
```