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Impact of Public Debt on Economic Growth in Ethiopia

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IMPACT OF PUBLIC DEBT ON ECONOMIC GROWTH IN ETHIOPIA

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List of Acronyms

GDP: Gross Domestic Product

IMF: International Monetary Fund

HIPC: Highly Indebted poor Countries

MDRI: Multilateral Debt Relief Institute

SDPRP: Sustainable Development and Poverty Reduction Program

SOE: State owned Enterprises

PDC: Planning and Development Commission

MOF: Ministry of Finance

DSA: Debt Sustainability Analysis

GTP: Growth and Transformation Plan

UNCTD: United Nations

EXIM : Export Import

NPV: Net Present Value

PASDEP: Plan for Accelerated and Sustainable Development to End Poverty

GTP: Growth and Transformation plan

Abstract

This study investigates the impact of public debt on economic growth in Ethiopia; by using data covering a period of 28 years from (1991-2018). Data were tested for unit root using Augmented Dickey Fuller (ADF); Johansson trace and max statistics for co integration; Vector error Correction Model (VECM)wasalso applied to test long run relationship, and to determine short run dynamics. . VEC/model diagnostic tests were also conducted and found that there was no autocorrelations, the residuals were normally distributed and the model is stable. The finding of the study revealed that there is a long run relationship between economic growth and External, domestic debt, debt servicing, nominal lending rate and exports. It is concluded that external debt has statistically insignificant effect on economic growth; domestic debt has positive and statistically significant impact on economic growth. The results also indicated that debt service payment has negative but insignificant relation with Per Capita GDP, to Furthermore, export has positive impact but nominal lending rate has insignificant impact on economic growth.

It is recommended that effective utilization of external debt should be considered since huge amount of foreign debt have been taken and from the research finding, there is insignificant relationship to economic growth .However, domestic debt should be made to induce economic growth.

Keywords, Domestic Debt, External Debt and Debt Servicing

CHAPTER ONE

1.1. Background of the study

Developing countries are characterized by poverty and macroeconomic instability, and they have been through many development programs to boost economic growth, therefore, they have been financially constrained to realize poverty reduction and other development schemes through domestic savings. Thus, Debt is a key option to consider.

Debt is from both internal and external sources aimed to fill the resource gap between savings and investment. External debt is the function of low productivity, income and saving in developing countries which have weak private financial sectors Adepoju et al. (2007); therefore, these countries seek, financial, managerial and technical assistance from developed ones.

Debt is the result of the act of borrowing Likita (2000), cited in Amaru et.al. (2013) and they also defined debt as contractual obligation accumulated with a promise to payback at a future date. Developing countries has two sources to finance investment and saving gap, domestic and external debt. External debtis used to fill the financing gap developing countries face due to low savings, since their financial sector is not deepened. External debt has debt overhang effect if it is not utilized effectively and efficiently until optimal amount, according to Krugman's hypothesis (2008), there is likelihood that external debt will impact economic growth in the long run.

Domestic debt is also another alternative to finance the deficit of government budget, according to paniza (2008),domestic debt is becoming significant mode of financing gap replacing external debt and it has crowding out impact on private sector investment as government use huge share of resources to finance its budget deficits can have a crowding out effect on private investment since the government will share resources that should have been used by private sectors as developing countries do not have enough saving; thus, developing countries borrow from both external and domestic sources to finance saving and investment gaps to bring about economic growth.

Economic Growth can be defined as a sustainable increase in real Gross Domestic Product (GDP) and real GDP per capita. GDP is the total market value of all final goods and services produced annually by resources located within a country, regardless of their ownership. Real GDP is GDP adjusted for inflation, that is, nominal GDP divided by the price index. Real GDP per capita is simply real GDP divided by the total population. Thus, economic growth is a quantitative measure Girma (2018).

Ethiopia registered about 10 percent GDP growth rate on average in the past decades, poverty significantly fell, and per capita improved, however in 2016 el-Niño induced drought affected the economic growth rate to decline at 8 %, contributed by low agriculture production, 2.3%. Export remained stagnant during the past years of GTP-I and II implementations with the total receipt of below 3 billion USD, Plan & Development Commission (2018).

Developmental state ideology followed by public led investment, that state owned enterprises have large responsibilities regarding high expenditure investments on sugar, chemical, irrigation and Hydropower dams that could take billions of dollars to implement. The aim was to invest on these productive sectors to produce export products by borrowing from external sources both bilateral and multilateral so that debt will be paid from export receipts.

Most projects such as sugar, chemical and Great Ethiopian Renaissance Dam failed with their multibillion dollar accumulated debt. Therefore Ministry of Finance and Economic Cooperation cuts state owned enterprises external borrowing and outstanding non-concessional commercial debt, (IMF country report 2018).

IMF's debt sustainability analysis report (2018), emphasizes, stagnation and low base in the exports sector in 2016/17 coupled with export -oriented sector projects and maturity of 5 year non –concessional debt resulted in worsening of debt sustainability analysis indicators relative to 2016. Moreover, National Bank of Ethiopia took measures such as devaluation in 2017 in terms of USD to reduce overvaluation and increase competitive ness and to mitigate the effect of inflation. NBE also increased interest rates and adopted a restrictive stance to the commercial banks. This is so because hoping export will boost to finance its development projects and service its debts. Ethiopia's risk of debt distress was assessed as "High-risk" in the2018 DSA, but risks have increased so the ability to pay its accumulated debts will be reduced, that will lead

to liquidity and solvency problems, debt overhang, that is, debt will be beyond country's repayment ability then expected debt-service costs will reduce further domestic and foreign investment (Karagol, 2002). Most of the countries development projects are financed by external borrowing that likely affect economic growth.

To make matters worse, Ethiopia has been paying its external debts taken by SOEs to finance its development projects by borrowing from domestic sources such as CBE that could be a vicious circle and even unable to further borrow from external sources. Moreover, ministry of finance started coupon bond to finance SOEs, such as electric power generation, on development projects.

Debt, both external and internal, currently, affecting Ethiopia's position in debt sustainability and distress IMF (2018), through, low export performance, delays in high public led development projects.

1.2. Statement of the Research Problem

Ethiopia is facing challenges in servicing external debt due to decline in export bills in the past decade and is ranked as "High risk" (IMF, 2018). In its Debt sustainability analysis (DSA) report on Ethiopia, the DSA document even emphasizes that risks have increased in terms of debt distress in the future.

Government budget deficit is increasing so that domestic debt is the main source of financing as the external debt servicing decline due to a decline in foreign resources to service external debt repayment.

Ethiopia's external outstanding stood at US$ 343.7 million in 1975 (14% GDP, US$9.1billion in 1991(214% GDP), US$ 10.2 Billion in 1999 and in 2004 benefited from Highly Indebted poor counties (HIPC)program external debt declined to 3 Billion USD, Desta (2005).

Ethiopia's external debt size is currently 26.4 Billion USD, (Inc. Ethio-Telecom & EAL) (31.3% GDP,), and that of domestic debt stood at 20.46 BillionUSD (16.9% GDP) and a total of 48.2% to countries' Plan & Development (2018), and present value of total debt is 44% of GDP.State Owned Enterprises took lion share, Planning Development Commission (2016/17). This could be more serious issue if we further notice HIPC and MDRI are no longer active to issue debt write-off since 2014.

Currently the domestic debt size is 43.6 % of the total public debt that make domestic debt significant source of financing which tells us there is a growing trend of domestic debt as a source to finance government investment.

Recently PDC (2018) reported that external and domestic debt outstanding debt stood at 26.4 Billion USD (31.3% GDP) and 20.46 (16.9% GDP) where now is no HIPC debt relief program and the country has many development projects online to complete.

Studies conducted previously in Ethiopia came to different results, Desta (2005) used co integration& ECM approach and OLS and reported that external debt stock impact economic growth positively.

Amsalu (2017) used data from (1982-2016) and deployed Vector error correction model then found external debt stock if it is utilized optimally, would have positive impact on economic growth but external debt servicing had crowding out effect

Some researchers such as Hana(2013) used co integration approach and deployed only data up 10 years to 2010, and concluded external debt servicing impacted economic positively even if the result deviated from theory of crowding out effect. And others concluded external debt has negative impact on economic growth of Ethiopia using data from (1985-2015) and VECM model, Tsigereda (2017).

This study focuses on investigating the recent debt dynamics as the previous studies on "impact of external debt on Ethiopian economic growth", found different results and the current issues on debt sustainability issues regarding external debt accumulation and debt service by government of Ethiopia and IMF &WBI coupled with the demand for financing development projects to boost economic growth and exports by state owned enterprises rationalize to conduct in-depth study to show which one of the previous studies findings are supported.

The study also focuses on impact of domestic debt on economic growth as domestic debt in recent times is the issue in making it an alternative financing source, according to Paniza(UNCTD, 2008) and 43 % of Ethiopia's total debt is financed from domestic debt since demand of domestic debt is growing recently though developing countries are characterized by

low domestic saving , and as far as the researcher's knowledge is concerned there are no previous studies conducted in Ethiopia on the effect of domestic debt on economic growth.

1.2.1. Research Questions

I. Do external borrowing has impacts on the pace of growth of the Ethiopian economy through debt overhang?

II. Do external debt servicing has impact on economic growth through crowding out effect on investment in the Ethiopia?

III. Does domestic debt impact economic growth through crowding out effect on private investment in the Ethiopia?

IV. Do export and nominal lending rate have impact on economic growth?

1.3. Objectives of the Study

1.3.1. General Objectives

The general objective of the study is to assess the effect of public debt on economic growth of Ethiopia.

1.3.2. Specific Objectives

I. To assess the effect of external debt on economic growth in Ethiopia.

II. To examine the effect of domestic debt on economic growth in Ethiopia

III. To find out impact of external debt servicing on economic growth of Ethiopia.

1.4. Scope and Limitation of the Study

The study pursues analysis of Ethiopia debt and its impact on its economic Growth. In order to fully capture its effect on the economy, a thorough empirical investigation was conducted with data covering a period of 28 years that is from(1991-2018) . Moreover, only government and government guaranteed debt is considered in this research as it focuses on public debt. The study focuses on selected variables only; since the data collected from different sources had some inconsistency and lack of data to use time series data longer than 28 years.

1.5. Significance of the Study

The burden of debt has been a matter of great concern to the Government of Ethiopia and the nation as a whole which has resulted in embarking upon drastic actions like dividing the nation's scarce resources in servicing of debts annually, one of the ways to service its external debt is exporting sesame to EXIM bank of China and using domestic debt to buy hard currency to service its external debt.

This action has thus led to disinvestment in the economy, and as a result a fall in the domestic savings and the overall rate of growth. The study seeks to investigate the direct impact of domestic and external debt" debt overhang" ;and crowding out effect" aspect, by finding a long and short run causal relationship with economic growth.

This study is significant as it includes additional ample amount of debt data of State Owned Enterprises total taken debt, both from domestic and external sources to finance its findings will provide a basis which will aid policy makers in proffering polices aimed at managing the debt crisis situation in Ethiopia. More over the scope of the study will also differ from previously conducted researches as it focuses on 28years' time series data (1991-2018), since it is difficult to use 30 years or more time series data due to data inconsistency, that enables me to define my paper in terms of scope and in depth analysis and domestic debt is becoming an issue of alternative financing for development, therefore it has significance to know its relationship with economic growth.

1.6. Organization of the Study

This study is structured as follows: Chapter one provides the research background, research objectives, and significance of the study, scope and the limitation of the study. Chapter two comprises of theoretical and literature studies on impact of public debt on economic growth and in Ethiopia and a conceptual framework. Chapter three covers the methodology. Chapter four covers the findings and finally chapter five covers the Conclusions, policy recommendations, and areas for further research.

CHAPTER TWO

Literature Review

2.1. Introduction

There is no doubt governments in developing world rely on both domestic and external debt to finance their budget deficit and gap in investments- saving. This is so because of weak position of developing countries to generate domestic revenue through taxes due to low institutional capacity, and low saving capacity as the financial sectors are not deepened, low income of citizens to save will push government to seek external sources to generate capital for financing its development projects and consumption. Furthermore, developing countries have low export bill as their export items are mainly primary products.

Solow neoclassical economic theory states debt has positive effect on economic growth because it enhances investment. This section discusses the, theoretical, empirical and conceptual framework of previous works.

2.2. Basic Definitions

External Debt: refers to public debt owed to external creditors such as; International institutions, countries and private investors among them are multilateral creditors such as International Development Association (IDA), African Development Bank (AFDB), World Bank (WB), International Monetary Fund (IMF) , **Paris Club** and other international financial institutions. Others are bilateral creditors which are essentially other countries; for example China, Japan, Italy, Kuwait, Saudi Arabia, South Korea, Abudabi and Germany as well as commercial creditors.

Concessional Loan: No or little interest bearing loan with low service & commitment charges and longer maturity

Commercial Loan: Higher interest, commitment and service charges, shorter maturity period loan

Domestic Debt: refers to the total debt owed to local investors, Banks, NBE and Government institutions in the form of treasury bonds, treasury Bills, Coupon Bond and Direct advance.

Treasury bill: a short-dated government security, yielding no interest but issued at a discount on its redemption price.

Treasury bond: an interest-bearing bond issued by the National bank of Ethiopia.

Coupon Bond: an investment bond issued to SOEs on which interest is paid by coupons

Direct Advance: claims on government by national bank where the money is financed from the reserve.

Crowding out effect: refers to using significant portion of foreign capital is used, to Service external debt rather than financing economic development.

Debt overhang effect: It occurs when there is some probability that in future, debt will be larger than the Country's repayment ability where anticipated debt service costs will depress further domestic and foreign investment.

Per capita GDP: is the ratio of Gross Domestic Product to Mid-Year Population

Lending Interest rate: The actual rate given by the Central Bank and calculated in percentage.

Spurious Results: False or inconclusive Results without authenticity or validity.

External Debt Service: Refers to the government External debt repayment including principal, commission and interest payments.

Government Guaranteed Debt: is a debt borrowed by SOEs and the government guarantees the repayment to the creditors.

Source: Ministry of Finance, and Plan & Development Commission, Literatures

2.3. Theoretical Literature

Developing economies are characterized by low income, saving and expenditure management system that leads to have low domestic investment as a result of poor resource mobilization capacity due to mentioned reasons above. Solow (1956) neoclassical model asserts that economic growth can be brought by expansion of investment. The model emphasizes that to achieve economic growth by increasing the amount of savings and investment. To realize this, countries have two options to mobilize resources, domestic and external, that can be generated

through taxes, non-tax revenue sources, grant, remittances and debt. In case of developing countries, governments finance their deficit using taxes, non-taxes and domestic borrowing, however, realistically low saving make it difficult to fill the finance gaps, and to seek alternative finance from abroad in terms of external debt for financing development projects and consumption.

2.3.1. Debt overhang Theory

Krugman (1988) debt overhang theory states that there is probability in the future debt will be larger that countries repayment ability, debt servicing costs will be discouraging to further investment as the expected rate of return will be very low since it will be shared by the creditors. This gradually discourage both domestic and foreign investment so does economic growth (Krugman, 1988, Sachs, 1989a).

Were (2001) debt overhang even gets worse that debt not only affect investment in physical capital but education, health and technology in the long run. Debt Countries can have both liquidity and insolvency problems; liquidity is the current phenomena where countries fall short of money to pay debts currently, but overhang is a situation where counties are unable to service their debts in the long run termed as insolvency; according to (Ajayi, 1991) a country is insolvent when it is incapable of servicing its debt in the long run.

Liquidity problem has been issues for indebted poor countries overtime , that is , countries have been facing shortfalls to pay their debts in short term; Jonse (2002) emphasizes that although the indebted poor countries have been solvent the willingness to pay decline for a variety of reasons major ones from domestic factors mostly known is wrong macroeconomic policies such as fiscal irresponsibility and exchange rate misalignment, policies that deter savings such as negative real interest rates, which in turn reduce investment and encourage capital flight and financing long-run projects with short-term credits. External factors reasons for unwillingness are; terms of trade decline and rising foreign interest rates and oil.

Freytag, et.al (2008) the NPV of the debt servicing increases with debt stock up to a certain optimal point beyond which a high face value of the debt will be associated with low efforts and investments, lower economic growth and lower NPV of expected debt service. In the case of

public investment, the incentive to investment is discouraged when a huge share of the return on the debt is paid to the creditor (Johansson 2010).

Adegbite, (2008) the Dual Gap theory explain why developing countries seek external finance as opposed to domestic financing the sustainable development. According to the theory in developing countries the level of domestic savings is not sufficient to finance the needed investment to ensure economic development; and investment is a function of savings it is sometimes mandatory to import complementary external goods and services, capital goods, and most of LDCs are far from their steady state, so is Ethiopia, investment injection could lead then to have accelerated economic growth.

Domestic debt on the other hand is the alternative source of financing which recently developing countries have been shifting towards domestic debt to finance government investment gaps, both budget deficit and project financing by State owned enterprises. Domestic debt is the financing government budget gap and demand from development project by SOEs, in Ethiopia case, by internal sources.

The major instruments of government domestic borrowing are treasury bills, bonds and Direct Advance (DA) that is borrowing from central bank. Currently Ministry of finance started coupon bond to finance State Owned Enterprises, particularly, to EPPCO to implement power generation projects. Since domestic debt market is not well developed to get money through treasury bills, direct advance is the major component of domestic debt.

Government Bonds, with longer term maturity (10 years and more); have been issued for special purposes rather than as a means of raising money to fill the budget gap. The major holders of government securities in Ethiopia are the National Bank of Ethiopia and the Commercial Bank of Ethiopia followed by government and private banks and insurance companies, Public Servants Social Security Agency and other public enterprises.

Domestic debt can be a base for both primary and secondary market if there is a free market activity with market interest rate.

2.3.2. Traditional view on Domestic Debt (Tax cut or Deficit)

The traditional views, on the effect of public budget deficit to encourage consumption by cutting taxes argues that, cutting taxes and encourage consumption to stimuli aggregate demand will have positive effect in the short run but negatively affect economic growth in the long run. This view explains Government budget deficits financed by borrowing make consumers relatively richer than they would be without borrowing; then Consumption increases that will be a stimulus aggregate demand to increase output in the short run.

2.3.3. Recardian View on Domestic Debt (Tax cut or Deficit)

This view is developed by Ricardo (1820) and later advanced by Barro(1989) known as Recardian equivalence, argues that debt financed tax cut (budget deficit) has no effect on consumption, output, interest rate , Real GDP and net exports even in the short run.

Consumers are modern, and know that a debt-financed tax cut today is equal to an increase in future taxes that is equal in present value to the tax cut or deficit. Thus, the tax cut does not make consumers better off, so they do not spent or raise consumption. Thus according to this view, consumers save the full tax cut in order to repay the future tax liability. As a result, private saving rises by the amount public saving falls, magnitude of national saving remains unaffected. Therefore there is no change in consumption and aggregate demand to push out put any further.

The critics on this view is that, not all consumers think that far in the future, not all consumers are able to borrow because there is no perfect mobility of capital enough money therefore they spend the tax cut instead, and consumers may expect, in the future they may not repay tax cuts so they spend in present times.

2.3.4. Keynesian view on consumption

Following Great depression "depression economics," as Keynes' eminent book The General Theory of Employment, Interest, and Money was written 1936 book was informed by directly observable economic phenomena arising during the Great Depression, which could not be explained by classical economic theory that glorifies market economy. Keynes asserted government intervention is mandatory during the time of economic crisis and it was of great acceptance.

The Keynesian demand side Aggregate demand or Gross Domestic product (GDP) is given by the equation:

Y=G+I+G+X-M, where y is GDP, G is Government purchase or spending, I investment and X-M is Export less Import and multiplier effect is one of major findings of Keynesian economic models. Thus, to Keynes' theory of fiscal stimulus, an injection of government spending eventually leads to added business activity and even more spending multiplied by 1/1-b, where b is marginal propensity to consume. This theory recommends that spending boosts aggregate demand and generates more income. If employees are willing to spend their extra income, the resulting growth in gross domestic product (GDP) could be even greater than the initial stimulus amount.

The magnitude of the Keynesian multiplier is directly related to the marginal propensity to consume. Its concept is simple: Spending from one consumer becomes income for another worker. That worker's income can then be spent and the cycle continues. Keynes and his followers believed individuals should save less and spend more, raising their marginal propensity to consume to effect full employment and economic growth.

In this sense if tax cut results in increase in consumption, using Keynesian multiplier spending will boost aggregate demand then output (GDP).

In Ethiopia case, tax revenue is not growing as desired to finance huge public investments, Tax to GDP ratio stood at 7%, where it is below sub-Saharan average of 15%, weak tax administration, low tax base and diversity in tax items are major reasons for low performance in tax revenue collection, thus, consider this a tax cut then financing the gap of growing budget deficit through domestic debt.

2.4 Empirical Literature

Domestic debt is the government’s fiscal deficit financing mechanism when there is no enough capital from external sources due to default or inability to discharge obligations to pay external debt by many reasons ,some reasons of insolvency is that, decline in export earnings, low economic growth , and in Ethiopia case failure or untimely completion of export oriented development projects ,thus lenders become curious on the future loan disbursement to these

countries but most researchers focus on external debt thus empirical researches on the relationship between domestic debt and economic growth is limited in this regard.

Hana (2013) only used data up 10 years to 2010, found that external debt stock does not affect economic growth but does debt service positively, Hana explained the reason why debt servicing has positive effect on economic growth it was due to debt relief and rescheduling but it deviated from theory.

Amsalu and Tsigereda found negative impact of external debt stock and service in line with theories. However, Desta (2005) found external debt resulted in both external debt accumulation and debt service impacts economic growth negatively.

Barro (1980) investigates the effect of domestic debt on economic growth using the unexpected component of domestic debt, or the debt stock and growth. He concludes that the unexpected component of domestic debt affects growth. Christensen (2005) study the role of domestic debt markets in sub-Saharan Africa based on a new data set of 27 sub-Saharan African countries during the 20 year period (1980-2000) and show that domestic markets in these countries under study is generally small, highly short term and often have a narrower investor base. Moreover, domestic interest rate payments present a significant burden to the budget with significant crowding-out effects.

Abbas (2007) and Abbas and Christensen (2010) on their research in low income countries (including 40 sub-Saharan Africa countries) analyzed optimal domestic debt levels in and emerging markets between 1975 and 2004 then investigate moderate levels of marketable domestic debt as a percentage of GDP have significant positive effects on economic growth. The study indicated that debt levels that exceed 35% of total bank deposits have negative impact on economic growth.

Akram (2015) in is research conducted in Philippines found that domestic debt has a negative relationship with investment because of crowding out effect and positive relationship with economic growth. However, external debt has negative and significant relationship with economic growth and investment confirming the existence of “Debt Overhang effect” except insignificant relationships of debt servicing with investment and economic growth, therefore it did not have crowding out effect.

Optimal domestic debt should be analyzed since external debt cannot be obtained when needed, in such cases; governments look for domestic options to finance the budget deficit, however they should critically look at all angels of the economic dimensions, investment and inflation, and other factors to be affected as optimal points are surpassed.

Maana et.al (2008) examined the impact of domestic debt on Kenya's economic growth the study focused on whether domestic debt impacts private sector lending by applying ordinary least square technique using time series data over the period 1996 to 2007.The study showed that domestic debt does not crowd out private sector lending because there is financial development in Kenya. The study also examined effects of domestic debt on real GDP by using a modified Barro growth regression model and found that increase in domestic debt has a positive but insignificant effect on economic growth during the period. The study suggests that government should employ wider reforms that promote investment in treasury bonds and encourage institutional investors.

The roles of external and domestic debt in Indonesia's macroeconomic situation have been researched and the result showed positive impact on both investment and economic growth, Muhdiet.al (2009). But aside from these positive effects, the policy produces domestic currency depreciation. On the contrary, rising trend of domestic debt discouraged private investment due to crowding-out effect, which reduces capital stock and total production. Ethiopia's situation seems different whether domestic debt crowd out private investment in the country because huge share of investment has been undertaken by State owned enterprises.

Muhammad et.al (2009) investigated the impact of rising domestic debt on the Nigerian economy by applying OLS technique using time series data from 1986-2005. The findings of the study showed that several factors responsible for rising domestic debt in Nigeria are high budget deficit, low output level, increased government expenditures, high inflation rate and narrow revenue base. The analysis shows that domestic debt has negatively affected the growth of the economy and recommended that government should made efforts to resolve the outstanding domestic debt.

Peteret.al (2013) also had different conclusion on the effect of domestic debt on Nigerian economy; they found domestic debt has positive impact on economic growth but debt servicing

has negatively affected economic growth. The authors recommended enhancing domestic debt financing on productive sector.

Muhammad et.al (2010) using data of 1972-2009, on the effect of domestic debt on Pakistan economy investigate that "stock of domestic debt affects the economic growth positively in Pakistan" but domestic debt servicing negatively affected economic growth, authors also justified why domestic debt stock has positive impact on economic growth because domestic borrowing partially been utilized to finance government expenditure to enhance growth ;and debt servicing is non-productive expenditure thus affected economic growth negatively. Moreover, the study also show negative impact of debt servicing is greater than that of positive impact of domestic debt stock, therefore policy makers were advice to resolve the issue of outstanding domestic debt with some strong policy.

James et.al (2016), research work studied the impact of Domestic Debt on Economic performance in Nigeria using data from 1970 – 2013 , using OLS Estimation and Multiple regression analysis were deployed to examine and measure the relationship between Domestic Debt and Economic growth, Inflation and Unemployment, thus found Domestic debt has a negative but insignificant impact on economic growth in Nigeria, ten recommended "for national debt to benefit the economy, it must be a productive debt and an efficient debt management scheme should be put in place".

Sheikh et.al (2010) used time series data from 1972 up 2009 to investigate the impacts of domestic debt on economic growth ,both stock and debt service, in Pakistan using the OLS technique, thus they found domestic debt servicing negative impact is stronger than positive impact of domestic debt stock on economic growth. According to this study Pakistan paid more than the economic benefit it could get from domestic debt.

Umaruet.al (2013) used 1970-2010 time series data and found external debt has unfavorable impact on Nigerian economic growth, on the contrary , domestic debt if properly utilized and managed it can affect economic growth positively. However rigorous effort should be made by policy makers to manage the debt effectively by channeling them to productive activities in order to increase the level of output in Nigeria, but most developing countries contract debt for selfish reasons rather than for the promotion of economic growth through investment in capital formation and other social overhead capital. But the authors did not justify why domestic debt

has positive impact on the Nigerian economy. James et.al (2015) research on effect of domestic debt on East African Community (EAC), using 1990-2010 panel data, found that domestic debt has a positive significant effect on per capita GDP growth rate in the East African Community and recommended to encourage sustainable level of domestic borrowing to boost economic growth.

External Debt on the other hand, is the better financing source developing countries seek since most of the imported goods and services need hard currency that these countries deficient, low saving, weak financial institutions and export performance due to narrow uncompetitive private sectors, capital flight and other reasons, external debt is demanded to finance gap between savings and investment, additionally to utilize it through their citizens consumption.

Iyoha (1999) indicates there is a significant debt overhang and crowding out effect in Sub-Saharan Africa that is; the large amount of stock of external debt and debt service payments had a depressing effect on investment in SSA so does economic growth. Barfour.O (1995), conducted research on Ghana, showed that debt repayment positively causes constraints on a debtor country's growth prospective since it involves the transfer of resources to other countries. Thus, debt service should be unequivocally as important concern as countries indebtedness since significant portion of debt repayment does constraint debtor's economic growth since few resources are spared to expand investment.

Ogunbiyi et.al(2015) investigated the impact of external debt burden on capital accumulation of Nigeria using time series data 1980-2012, using Gross fixed capital formation as proxy variable for capital accumulation and GDP, using OLS method to estimate the impact and found eternal debt has positive effect on economic growth about 68%, this means that, 1 million dollar debt can induce 680 thousand dollar capital in the country with curious recommendation for further borrowing.

Siddique et.al (2015) During studied about effect of external debt on economic growth of HIPC countries , emphasizing the debt crisis of poor countries in 1970s and 1980s, external debt taken from OPEC countries following high price increase in oil and the surplus revenue generated from oil sold, however, these poor countries declined to utilize external debt wisely on productive sectors, thus when oil price declined , indebted countries were unable to pay their

debts , there for stock of external debt impacts GDP of these countries negatively, and the authors , based on their findings, suggested in both runs (short and long), a reduction in debt stock might have impact on economic growth.

Panagiotis (2018), investigated the relationship between economic growth and government debt and other economic factors in Greece, where disproportions persist several years after the financial crisis. Moreover, the study has shown the issue of break effects between government debt and economic growth. The results found to show that the relationship between debt and growth depends on the debt breaks. Specifically, at debt levels before 2000, increases in the government debt-to-GDP ratio are associated with insignificant effects on economic growth. However, as government debt rises after 2000, the effect on economic growth diminishes rapidly and the growth impacts become negative. The challenge for policy makers was to control or stop the rising of government debt by keeping a sustainable growth path. Authors recommended fiscal discipline should be combined with the implementation of coherent, consistent and sequential growth-enhancing structural reforms. The Greece experience can show there is an optimal debt to deal with to bring about economic growth, pushing government debt beyond the desired amount can halt economic growth.

Sami et.al (2018), researched the relationship between government external borrowing and economic growth, to finance Oman's government annual budget. 1990-2015 time series data was used and the ARDL co integration deployed and error correction model to ascertain the short-run dynamic nature of external debt and economic growth, and found negative and significant influence of external debt on economic growth in Oman, thus, recommended a more productive use of the external debt fund in order to affect positive growth.

The study on heavily indebted poor African countries to investigate the impact of external debt on economic growth through the debt overhang and debt crowding out effect by Ejigayehu et.al (2013) using time series data between the period 1991 to 2010 and result from estimation showed that external debt impact economic growth by the debt crowding out effect rather than debt overhang. Moreover, the authors tried to in an attempt to spot debt servicing history, the thesis found the selected countries are not paying (servicing) more than 95% of their accumulated debt. According to this study almost no debt is paid back by these countries and one

can imagine how this HIPC are continuing to entertain debt flow, better explanation is debt write off or restructuring.

Kumar et.al (2010) used 1970-2007 panel data to study the impact of high public debt on long-run economic growth for a panel of advanced and emerging economies. Their empirical results suggest an negative relationship between initial debt and consequent growth: on average, a 10 percentage point increase in the initial debt -to-GDP ratio is associated with a slowdown in annual real per capita GDP growth of around 0.2 percentage points per year, with the impact being somewhat smaller in advanced economies. The study looked at Euro countries and it was a basis to look at an example in African developing countries to show the impact the public debt has on their economic growth. The variables were population, investment and government size. In the current study more parameters of public debt were added.

Akram (2010) examined the impact of public debt on economic growth in Pakistan for the period 1970-2009 using the Solow's growth model and found that public debt almost always results in deteriorating economic growth process as it affects investment. The current study borrowed heavily from this research including the model used since it was similar.

Achieng (2010) analyzed the effect of domestic debt on private investment using the Johansen Co integration approach and found that the variables were significant at 5%.

The research focused on domestic debt variable on private investment Kibui (2009) studied the impact of external debt on public investment and economic growth in Kenya (1970-2007). The study used time series data for the period 1970-2007 and reduced form growth model augmented with debt variables to examine the impact of external debt on public investments and economic growth in Kenya. The findings of the study indicate that the key debt indicators have been above the critical level since 1982.

The Empirical results of the time series data analysis for the period 1970-2007 indicate that debt service ratio is significant at explaining the GDP growth in Kenya. Public Investment has a negative relationship with both the stock of external debt expressed as a Percentage of GDP and debt service ratios.

The results indicate that debt relief could act as catalyst for investment recovery and economic growth in Kenya. The Kenyan government should also embark on an aggressive poverty reduction drive, focus on growth enhancing policies that will lead to increased export earnings, provide a stable environment for investments and implement measures that will increase investor confidence in local investments. The study concentrated on external debt on public investment and economic growth and ignored the domestic debt.

Makau (2008) conducted empirical study on the impact of external public debt servicing and economic growth in Kenya. The study used a single growth equation model estimated using Ordinary least Square (OLS) method with annual time series data covering the period 1970 - 2003. The findings of the study indicated that Kenya's external debt is mainly official, of which a bigger proportion is from multilateral sources. External debt accumulation has been rising over the years with debt burden indicators increasing steadily in the early 1990s. A "specification associated with error correction modeling (ECM) was applied. By using Co integration and error correction model, the study established both the short run and long run equilibrium.

The estimated model was a single regression equation with the growth rate of Gross Domestic Product as the dependent variable and explanatory variables were savings as-a ratio of GDP, stock of external debt as a ratio of GDP, debt service as a ratio of GDP, interest payment as a ratio of GDP and the annual growth rate of labor force. The empirical results in the short run estimated model indicated that the coefficients of external debt to GDP, savings to GDP and debt service to GDP had the correct sign and significant while the coefficients of interest to GDP and growth in labor force were insignificant.

In the long run estimated model, the coefficients of debt to GDP, debt service to GDP and savings to GDP were significant while the coefficient for growth in labor force and interest to GDP were insignificant. The study concentrated on public debt servicing on economic growth in Kenya.

Cholifihani (2008) analyzed long term and short term relationships between public debt service and GDP in Indonesia by applying co integration analysis of time series modelfrom1980 - 2005.These relationships used an extended production function model that measured GDP as a

function of debt service, capital stock, labor and human capital. The result show that Indonesia faces a debt overhang problem in the long run since increasing the public external debt service slows economic growth. The study was done in Indonesia and a Kenyan perspective is required to be analyzed.

M'Amanja et.al (2003) looked at the fiscal policy and economic growth in Kenya using the multivariate co integration and vector error correct model. The results found that the external debt has a significant negative impact on long run growth and public investment and Imports have strong beneficial effects on per capital income in Kenya. The study concentrated on the impact of Government national expenditure on economic growth in Kenya. The study was done on a developed country on the impact of Government national expenditure. The study used this study to compare the impact of Government national expenditure of the developing county against that of developed county. The variables used inthis study were consumption, investment and transfers which differed from the researcher's.

2.5. Conceptual Framework of the Study

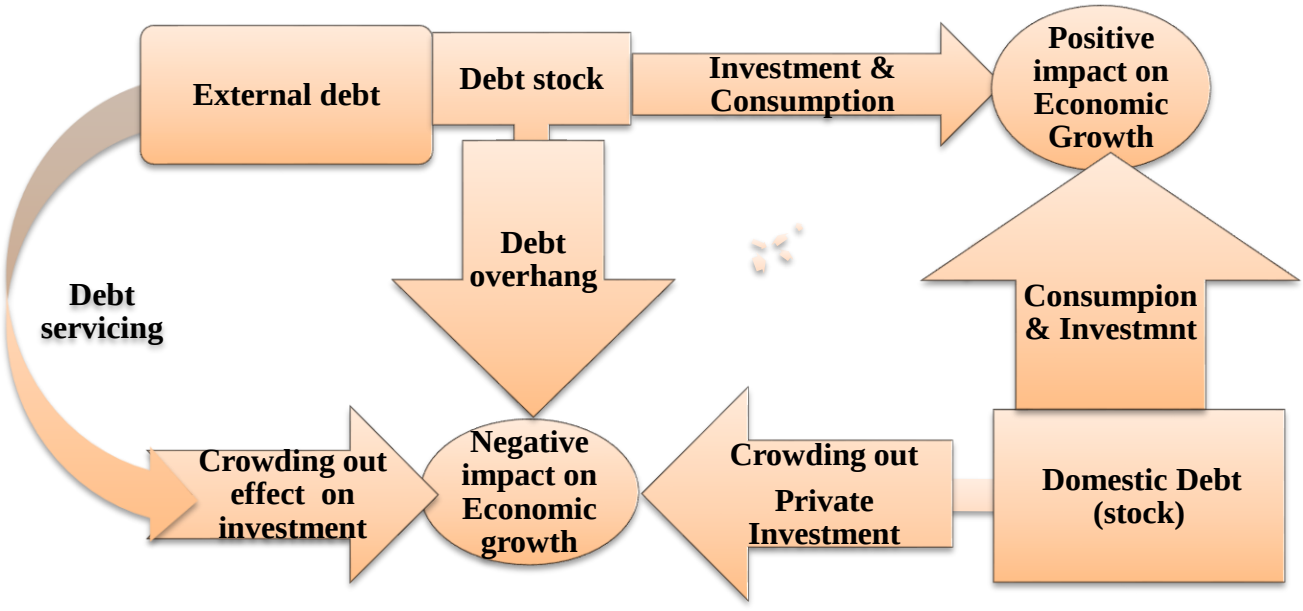

Figure 2.1 Conceptual Framework

Source (Author, 2019)

CHAPTER THREE

Research Methodology

3.1. Introduction

This chapter highlights the research methodology to be employed for the study. The methodology contains the design, data collection, the models to be used and data analysis. Since the study is about the impact of debt on economic growth in Ethiopia time series data is employed. Causality method is applied to conduct this study that will best show the impact of one variable on another variable, to determine the cause and effect relationship between the Economic growth in Ethiopia and public debt.

3.2. Research Approach and Design

This study deployed time series data of 28 years, co integration approach to examine the short and long run relationship between dependent and independent variables considered in the study, Vector Error correction Model (VECM) were used to find out the relationship.

3.3. Data Type , Source and Hypothesis

The study used 28 years annual time series data of the variables to be deployed from 1990/91-2017/18; the data sources used were National bank of Ethiopia, Ministry of Finance, and Plan and Development Commission of Ethiopia.

Table 3.1 Measurements and Variables Description

Name of Variables	**Data Source**	**Data Description**	**Hypothesis**
External debt	Ministry of Finance of Ethiopia	External Debt Accumulation as Stock Variable, used External debt stock amount in Absolute terms in USD	**Ho:External debt** does not have any significant impact on economic growth in Ethiopia
Domestic Debt	Ministry of Finance of Ethiopia	Domestic Debt Accumulation as StockVariable,used Domestic debt stock amount in Absolute terms in USD	**Ho: Domestic debt** does not have any significant impact on economic growth in Ethiopia

Name of Variables	**Data Source**	**Data Description**	**Hypothesis**
Percapita GDP		Different measures of GDP growth have been used in literature. In the present study, used Per capita GDP in USD	
External debt service	Ministry of Finance of Ethiopia	External Debt repayment as Stock Variable, External debt service amount in Absolute terms in USD	**Ho**:**External debt service** Does not have any significant impact on economic growth in Ethiopia
Lending Interest Rate	National bank of Ethiopia	The actual rate given by the Central Bank and calculated in percentage.	
Export	Plan and Development Commission of Ethiopia	Measured in terms of USD .To see the impact on economic growth since it is used directly to pay external debt.	

3.4. Data Analysis Technique

The data was collected and checked, edited and organized then got ready for second stage of pre analysis. The variables to use in the analysis are, Real GDP, domestic and external debt,. Diagnostic tests such as; Augmented Dickey-Fuller stationery test to test and prevent spurious regression, God-Frey's LaGrange Multiplier (L-M) correlation test, and the presence of long run relationship were tested using Johansson for co-integration using Trace and Max statistics was used because it is for series with two or more variables, and VECM model was deployed to determine whether there is the long and short run relationship between dependent and independent variables. Moreover, STATA 14 was used for data entry, organization, and analysis and Table reports

3.5. Regression Model

Adopted from Akram (2015) and he used Cunningham (1993) who introduced debt burden in to Cob-Douglas production function to explain Economic growth (GDP) as a function Capital and Labor, and debt as an additional input, like capital and labor, needed to accelerate investment which leads to economic growth.

The equation of Cob-Douglas production function using Domestic and external debt is as follows

Originally Q (L, K, and Debt) =$\alpha L^{\beta}K^{1-\beta}$ …..Which in this study is expresses as Domestic Debt (D) and **External Debt (E),** then the function can be rewritten as:

Q (Domestic Debt, External Debt) =$AD^{\beta}E^{1-\beta}$**---**

Where Domestic Debt Outstanding and External Debt Outstanding is representing domestic and external debt, adopted from Akram (2015) and used these two variables.

GDP = $\alpha DDO^{B1}EDO^{B2}E$

LOG GDP=A+ B1LOGEXT+ B1LOGDOM+E ---with increasing returns to scale due to technical change.

Where B1 is elastic coefficient of Domestic debt,

B2 is elastic coefficient of EXT debt and E is noise term.

Basically Solow growth model states that debt has an effect of economic growth through investment until some optimal point is reached, on the contrary debt has indirect effect on investment; thus, transmission mechanism through which the debt affects growth is its reduction on the resources available for investment by debt servicing. According to debt overhang hypothesis debt has a direct positive effect on economic growth until some point but pushing it further has a negative effect on economic growth.

Vector Error Correction Model (VECM) of Real Gross Domestic Product

Initially, VECM was devised to describe a relationship between the short-run dynamic and the long-run equilibrium (Sargan (1964)). Granger and Weiss (1983) and Engle and Granger (1987) pointed out that if two variables are co integrated at the first difference order, their relationship can be expressed as the VECM by taking past disequilibrium as explanatory variables for the dynamic behavior of current variables (Maddala and Kim 1998).

Some studies compile, in a single model both the short and long run variables (e.g. Fielding, 1997, Agrawal, 2001). For that, an Error Correction Model (ECM) can be used. This approach enables the long run equilibrium relationship and the short-run dynamics to be estimated simultaneously (Gujarati, 2003). This type of technique helps to correct the potential bias in the estimation of the coefficients in models with differences that do not take into account co

integration relationships. When these long-term restrictions are ignored, there could be an omitted variable bias (Gujarati, 2003).

Harris (2000), summarizes the four desirable features of ECM as follows:

- it evades the possibility of spurious correlation among strongly trended variables;
- the long-run relationships that may be lost by expressing the data in differences to achieve stationarity are captured through inclusion of lagged levels of the variables on the right-hand side;
- the specification attempts to distinguish between short-run (first-differences) and long-run (lagged-levels) effects; and
- It provides a more general lag structure, and does not impose too specific of a structure on the model.

The VECM used in this work is specified as:

$$\Delta PCGDP_t = \alpha O_t + \Delta B_1 DDO_t + \Delta B_2 EDO_t + \Delta B_3 EDS_t + \Delta B_4 NLR_t + \Delta B5 EXPt + B_6 DDO_{t-1} + B_7 EDO_{t-1} + B_8 EDS_{t-1} + B_9 NLR_{t-1} + B_{10} EXP_{t-1} + \varepsilon_t$$

The Ordinary Least Square Model is used to determine the results of the relationship between dependent (RGDP) and independent variables, Domestic Debt, External Debt, and Debt Service. The model fit as follows,

PCGDP= β0 + β1DOD + β2EDO+β3EDS +β4LnNLR+ β5EXP +E

Where, PC=Per Capita GDP

DDO = DOMESTIC DEBT OUTSTANDING

EDO= EXTERNAL DEBT OUTSTANDING

EDS = EXTERNAL DEBT SERVICE

NLR=Lending Interest Rate

EXP= Export

E=Error term

β0, β i= Constant Slope coefficients of DDO, EDO, EDS, DDS, NLR, EX

3.6. Diagnostic Tests

Test for Stationarity (Unit Root): Times series data was assumed to be stationary after unit root test was done to check stationarity of the variables. Using non-stationary data in regression model leads to spurious results where test statistics exhibit a significant relationship between variables even when no such results exist (Riman and Eyo, 2008).The study employed the Augmented Dickey Fuller (ADF) tests procedure. ADF test is a standard procedure conducted to test whether a series has a unit root. The basic equation used in the ADF test is expressed as:

(i) ADF with an intercept but no trend

$$\Delta Yt=\alpha+\rho Y_{t-1}+\sum_{i=1}^{k} di\Delta Yt-1+et$$

(ii) ADF with trend and intercept $\Delta Yt=\alpha+\beta t+\rho Y_{t-1}+\sum_{i=1}^{k} di\Delta Yt-1+et$

The ADF tests the null hypothesis:$|\rho|=0$against the alternative $|\rho|<0$ in the autoregressive equations.

Normality test: The study checked whether the variables followed the normal distribution. Jargue- Berra test was used to determine whether the variable is normally distributed. A null hypothesis of normality was tested against the alternative hypothesis of non-normal distribution. For normal distribution the JB statistic was expected to be statistically indifferent from zero.

Ho: JB= 0(not normally distributed)

H1: JB =0(normally distributed)

Rejection of the null for any of the variables would imply that the variables were not

Normally distributed and a logarithmic transformation was necessary.

Autocorrelation test: To test for autocorrelation the study used the LM (Lagrange –multiplier) test which:

Null Hypothesis (Ho): there is no autocorrelation

Alternative Hypothesis (HA): there is Autocorrelation was deployed to check whether there is serial autocorrelation in the time series.

Accepting the Null Hypothesis enables us to conclude that the error Term in the time series Model used has no autocorrelation and Vice versa.

CHAPTER FOUR

Research Findings and Discussion

4.1. Debt and Economic growth Situation in Ethiopia

4.1.1. Economic Growth of Ethiopia

Ethiopia has been implementing National Development Plans such as SDPRP (2005/06-2009/10), PASDEP (2010-2014), and GTP-I (2011-2015)and GTP-II (2015-2019) is being implemented all had common aim of poverty reduction and economic growth. All development plans implemented had their own shortfalls of financing, inflation, management, corruption and so on PDC (2014).GTP has been designed to solve problems that were seen in previous plans, domestic resource mobilization, and major problems seen in the past. During these plan periods, remarkable economic growth rate was registered.

Particularly in GTP-I and II period, the average economic growth rate was 10.2 percent per annum, which outweighs sub-Saharan average and the minimum growth rate recommended to achieve development goals, NPC (APR, 2018).Growth and Transformation plan was designed to transform the economy from agriculture to manufacturing base by efficiently utilizing agriculture, in terms of production & productivity, employment and income. As a result, share of agriculture to total declined and share of service sector took over. Ethiopia registered positive economic growth all over the GTP-I and II period, with the drought and political unrest occurred in the past three years. Per capita incomes in 1991 were 219 USD and currently it reached to 883 USD, 4 fold, it showed positive trend since 2002 up until the period understudy. Some researchers argued and of course the data shows public led investment has been huge and largely contributed to the economic growth.

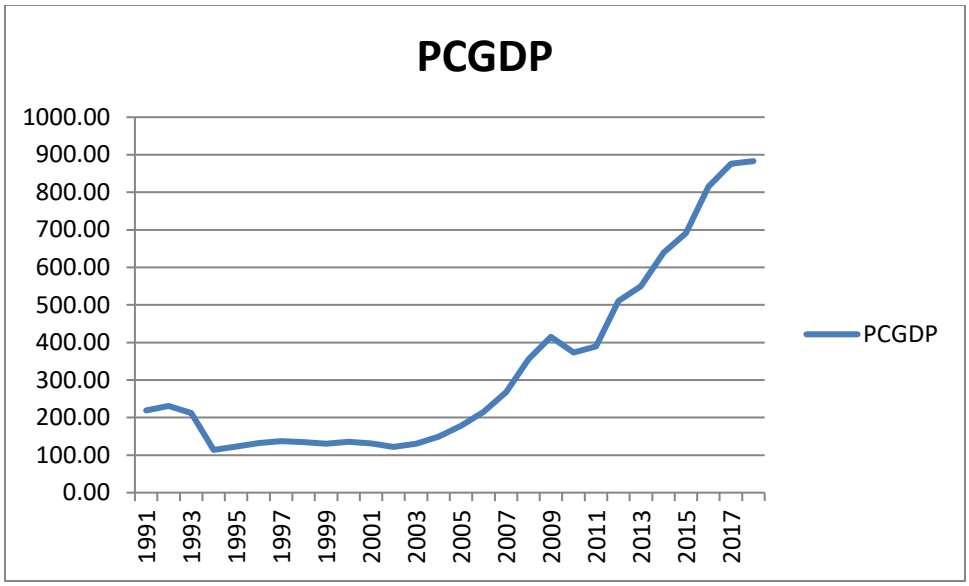

Figure 4.1 Per capita GDP through period (1991-2018) in USD

Since 2005 most of the public investment areas were mega projects such as, sugar, energy sectors, and chemical projects, financed by external and domestic debt. Great Ethiopian Renaissance Dam (GERD) project ,Gibe I.II and III, TANA BELES, YAYU Fertilizer manufacturing , 10 mega sugar projects, irrigation, railway, and road…. etc., were among major public projects facing challenges of failure and cost and time overruns. The reason behind problems is poor project management, corruption, poor planning, and awarding projects without conducting feasibility study, political decision outweighs business in State Owned Enterprises and so on. Those projects were aimed to contribute in countries export sectors, the two service external debt, however, external debt taken to finance those projects are currently reached their maturity dates, recently (2019) Ethio-Djibouti Railway project ,financed by Government of China and its contractors, become dysfunctional coupled with has its debt restructured because it reached maturity date before even starting operation.

However, there has been positive economic growth regardless of political stability, drought and climate change effects and macroeconomic disturbances.

4.1.2. Debt Situation in Ethiopia

4.1.2.1. Introduction

Debt is taken because there is no adequate finance to implement development goals. Therefore, both domestic and external debt situation of Ethiopia during the period under study are discussed below.

4.1.2.2. Domestic debt

Government of Ethiopia had been using domestic debt to finance its budget deficits and SOEs demand to finance projects. Major sources of Domestic debt are government bonds, T-Bills, and Direct Advance, and recently EPPCO started coupon bond. This study focuses on debts taken by government and government guaranteed debt by state owned enterprises. The main creditors of government domestic debt are its own institutions such as; Private and Public Social security agency, Commercial bank of Ethiopia, and National Ban of Ethiopia. The participation of private sector in buying T-Bills is very limited since interest rate remains below 3%, that is, below the minimum saving rate of banks. Direct advance means borrowing from National Bank reserves and had the major share of domestic debt; bond has been issued only for the special purpose to finance GERD Coupon bong recently started.

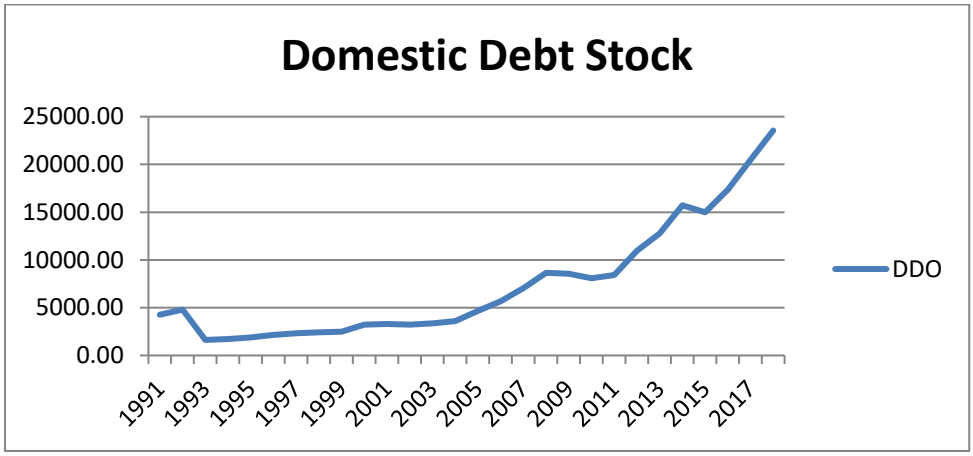

Figure 4.2 Domestic Debt Outstanding Through Period (1991-2018) in million USD.

Domestic Debt out Standing has shown an increasing trend since 1991that was 4 Billion USD and currently it reached 23.5 Billion USD, particularly after 2013, it run from 12.7 Billion USDto 23.55 Billion USD, about 2 fold within 6 years**.** This is mainly due to SOEs started to borrow from CBE to finance development projects. Thus, during considered years of the study

from 1991, direct advance had been the main source of domestic debt taken by the government, in chain of GTPs implementation.

Ethiopia over the past years, had an ambitious plan and projects implemented such as, Metal, chemical, pharmaceuticals, sugar, and cement etc., in GTP-I to bring economic transformation from agriculture to industry that needed ample amount of money to finance and domestic debt remained one of the sources.

Table 4.1Domestic Debt through different Development Plans

Plans	Period of Implementation	Domestic Debt Bln USD
Economic Recovery Program	(1996 - 2002)	6.1
Poverty reduction Program I	(2003 - 2005)	4.6
Poverty reduction Program II	(2006 - 2010)	8.1
GTP I	(2011 - 2014)	14.9
GTP II[i]	(2015 - 2020)	23.5

Source: Ministry of Finance.*conversion to USD made using Average interest rate*

Domestic debt through different plan periods has shown a rise at alarming rate, from that was 6.1in 2002 to 23.5 Billion USD in 2018, 4 fold, mostly taken from government bodies themselves. Domestic debt servicing had not been n issue until recently and government is using domestic debt servicing for financing in another budget year, rollout.

4.1.2.3. External Debt

External debt sources include, bilateral and multilateral institutions, mostly tied to concessional and somehow commercial loans; WBI, IMF, ADB, EU and other parties are creditors of the country. Countries also called Paris club have been long development partners, and Asian countries like China are major creditors, almost half of the countries outstanding domestic debt

were taken from China. Since Recently government of China has restructured Ethio- Djibouti rail way project loan and wrote of interest payments of it total debt.

External debt can be further classified as Government debt, government guaranteed debt and non-government guaranteed debt (loan taken by Ethio-Telecom and EAL), since the objective of this paper is on central government and government guaranteed debt, both Ethio-Telecom and EAL are excluded to emphasize more on public debt.

External public debt flow has been increasing in the past 3 decades from 9.1 Billion USD to 26.4 Billion USD; SOEs now become the main debtors.

Table 4.2External public debt stock

Plans	Period of Implementation	Central government and government guaranteed (Mln USD)
PASDEP	(1998 - 2002)	3324.3
GTP I	(2003 - 2007)	11781.9
GTP II	(2008 - 2012)	11293.8
Total		**26400**

Source: Ministry of Finance

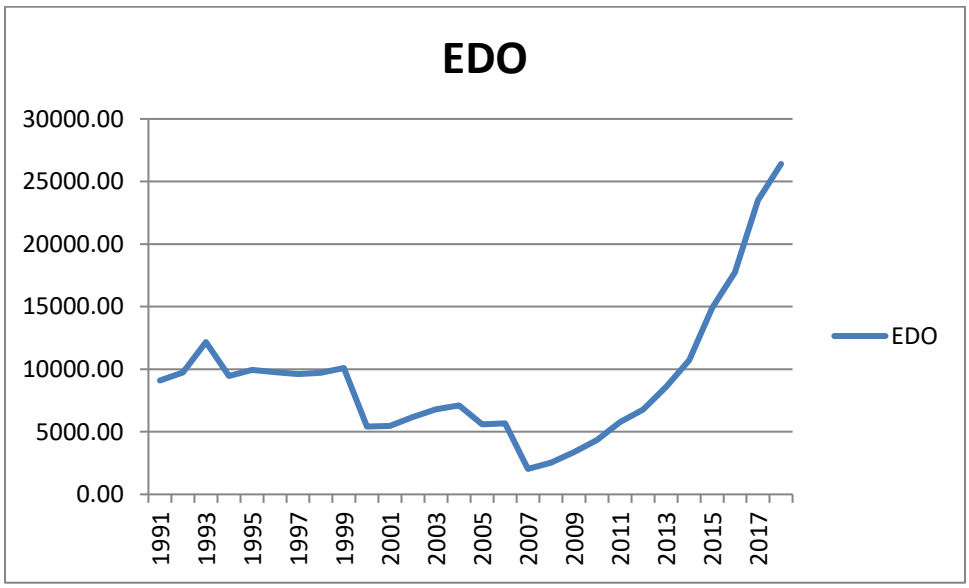

Figure 4.3 External Debt (1991 – 2018) in million USD.

External Debt Servicing

Since this study only focuses on central government & government guaranteed debt payments, because telecom and EAL are commercial entities and they are ranked they are credit worthy. Ethiopia's' debt servicing is characterized by HIPC and MDRI relief schemes that Ethiopia entertained in different periods that brought the country back to its debt sustainable position. HIPC was introduced in 1996 and were active until 2014, so is Ethiopia that has entertained debt relief, for instance in 2004, Ethiopia's debt was written off and outstanding debt declined to 3 Billion USD. Since 1991 up to 2018 total debt payment of 6.59 Billion USD has been serviced, that is 25% of the total outstanding debt (24 Billion USD), on the same token, 2.1% out of the total external debt outstanding is annually paid. The liquid source of debt payment is an export bill that showed a decline in the past GTP-I & II periods.

In the past years the government is reimbursing the debt payment that was already on the budget line it should have been paying because of debt relief and debt restructuring until 2014 when debt relief schemes are over.

Recently IMF gave critical advice to the government of Ethiopia reporting the country is now in high risk debt repayment for decline in export, failure and time overrun of development projects. China is one of the major development partners from which ample amount of debt resources were flown in .Most of the projects are financed and implemented by China, in 2019 interest payments were cancelled and some projects such as Ethio-Djibouti restructured.

Concept of Debt Sustainability, debt sustainability is the ability to borrow continuously for the financing gap the country is in. There are some common indicators to look at With the introduction of the HIPC Initiative in 1996, and its enhancement in 1999, the key indicators used to evaluate a country's debt sustainability are Present value of debt to exports, Present value of debt to domestic budget revenue and Debt service to exports.

Revenue is also another variable used as DSA indicator but not often considered due to reliability issue. The threshold of indicators differs from one developing country to another according to their efficiency of resource allocation, export, revenue and economic capacity. Ethiopia's debt to GDP ratio threshold is 40%, debt to export 180%, and debt servicing to export is 15% and actual threshold as of 2019 according to DSA result is 20.4%, 236.2% and 16.5% respectively. Therefore, decline in export pose the challenge in debt sustainability of the country.

Moreover, Total public debt (domestic external) threshold is 56% and actual in 2019 stood at 44.2%.International Resource Allocation Index (IRAI) determines DSA threshold,

(IRAI) Indicators

- Countries with IRAI 3.75 and above have strong economic policies and institutions to implement economic activities efficiently.
- Countries with IRAI 3.5 and above have medium economic policies and institutions to implement economic activities efficiently.
- Countries below 3.25 Countries with IRAI 3.75 and above have strong economic policies and institutions to implement economic activities efficiently.

Developing countries have weak policies and strong institutions, indicated by IRAI of mostly less than 3.25 meaning they are not utilizing resources efficiently, thus even if they have high GDP and exports to service their debts. IRAI is equally important in ranking countries in carrying capacity of external debt. Ethiopia has 3.5 IRAI that put it in the middle debt sustainable country.

Ethiopia's DSA threshold indicates that debt servicing should not exceed15% of export and actual figure indicated is 16.5% as of 2019 that is critical. Even if HIPC relief is terminated, China is going the other way to forgive Ethiopia's interest payments.

4.2. Results Regression Analysis

4.2.1. Diagnostic Results for Classical Linear Regression Model

Classical linear regression technique requires that all the necessary assumptions be made alongside the fulfillment of certain properties that must hold for the variables under study (Enders, 1995). Before estimation, these requirements were ascertained.

4.2.2. Unit Root Test Results

Table 4.3 Dickey Fuller test for Unit Root

Variables		Test Statistic	5% Critical Value	Test Statistic	5%Critical Value	Conclusion
		At Level		At First Difference		
PCGDP	Intercept	2.401	-2.994	-3.173	-2.997	Stationary at FD
	Trend & Intercept	-1.016	-3.592	-4.9	3.596	Stationary at FD
DDO	Intercept	3.398	-2.994	-3.138	-2.997	Stationary at FD
	Trend & Intercept	-0.064	-3.596	-5.548	3.596	Stationary at FD
EDO	Intercept	1.893	-3.592	-3.203	-2.997	Stationary at FD
	Trend & Intercept	1.595	-2.994	-4.372	-3.596	Stationary at FD
EDS	Intercept	-4.914	-2.994	-8.365	-2.997	Stationary at FD
	Trend & Intercept	-4.836	-3.596	-8.196	-3.596	Stationary at FD
NLR	Intercept	-3.543	-2.994	-5.585	-2.997	Stationary at FD
	Trend & Intercept	-5.612	-3.956	-5.579	-1.95	Stationary at FD
EXP	Intercept	-0.071	-2.994	-2.947	-1.95	Stationary at FD
	Trend & Intercept	-3.22	-3.596	-3.378	-2.997	Stationary at FD

From the ADF criterion, all variables except External debt Service were found to contain unit root at level, in both with intercept and Trend & Intercept , but at first difference all variables in the table were found to not contain a unit root at 5% level of Significance. This means that, all variables are stationary at first difference with intercept and with Trend & Intercept at 5% level of significance. If the calculated statistics is greater than the critical values in absolute terms, the null hypothesis that say the series contains unit root was rejected and the series said to be stationary (Judge, 1985).Therefore, all variables are stationary at first difference , and there is no spurious results situation.

4.2.3. Johansson Test for Co integration

If the time series variables have the long run relationship, suppose we can say the variables are integrated and going together in the long run, Johansson Tests for co integration using trace and max statistics deployed and found that there are three co integrating equations between time series between dependent Variable (Per Capita GDP) and independent variables.

Table 4.4Johansen tests for co-integration

Rank	Parms	LL	Eigen value	Trace Stat	5%Critical value
0	6	-1076	-	125.43	94.15
1	17	-1055	.79	83.01	68.52
2	23	-1038	0.70	50.29	47.21
3	33	-1026	0.6	**25.27***	29.68
4	38	-1018	0.43	9.9	15.4
5	41	-1013	0.28	.85	3.76
6	42	-1013	0.03	-	-

Null: rank -0there is no Co integration

As shown in the Table, rank –at value-o means the Null hypothesis which states there is no co integration and Null hypothesis is rejected where trace Statistics is greater than 5% critical value, and at Rank-3 we found 3co integrating equations. Therefore, there is co integration between variables per Capita and independent variables; this means that, there is a long run relationship. The author also used max-statistics to test the presence of long-run relationship between the variables and found that there is co integration. See also Apeendix.2.

4.2.4. Vector Error Correction Model (VECM)

Vector Error Correction Model is used when there is co integration or long-run relationship between time series variables, since, according to Johansson test there is a long run relationship. Furthermore, VECM can also show the short run dynamics. Firstly I identified the appropriate co integrating equation, ce1, co integration equation one is both significant and has negative sign. See also Annex-1

The Vector Error correction term is-0.299 and significant at 5% level of significance, then it can be concluded that there is a long run relationship running from dependent variable,

PerCapitaGDP,to the independent variables. The Term **-0.299** is also called the speed of adjustment towards the long-run equilibrium or steady state.

Regarding the short run dynamics, there is no short run causality running from explanatory variables to Per Capita GDP since the coefficients of Domestic and External debt are not statistically significant at 5% of level of significance. The speed of adjustment tells, 29.9% is adjusted every year towards equilibrium which is a slow adjustment.

4.2.5. Test for Serial Autocorrelation

Table 4.5 Lagrange-Multiplier Tests

Lag	Ch^2	df	Prob>Ch^2
1	28.65	36	.8
2	42.4	36	.2

Ho: No autocorrelation at lag order

As seen in table.4.It there is no autocorrelation in both lags where the P-value at Lag 1 is 0.8 is greater than 0.05 which we cannot reject the Null Hypothesis and it is concluded that there is no autocorrelation, and Lag 2 has a p-value of 0.2 where the value is greater than 0.05 so we cannot reject the Null Hypothesis that there is no autocorrelation. Therefore, in both lags there is no serial autocorrelation in the model.

4.2.6. Normality Test

Jarque-Bera test has been deployed to test whether the residuals are normally distributed , thus, the null hypothesis was ;the residuals are not normally distributed and the test result has shown that the p-value is greater than 5% , tells the rejection of null hypothesis. Therefore, the residuals are normally distributed, (see also Annex.1).

4.2.7. Model Stability Test

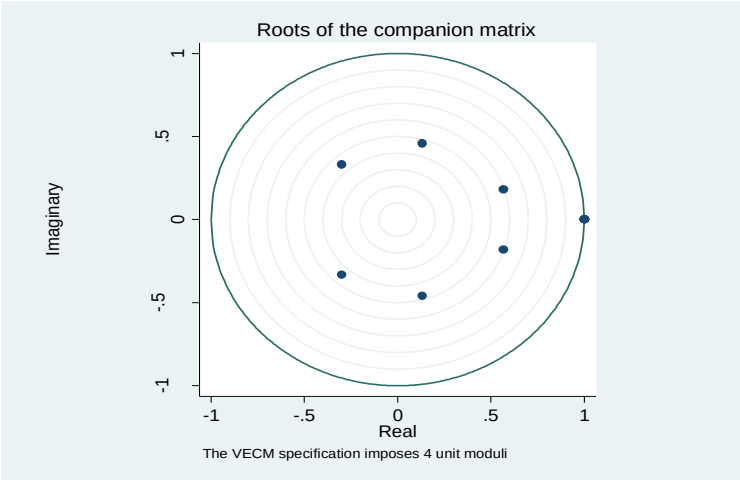

Figure 4.4. Model Stability

The model stability test, Eigen value stability condition checks whether the coefficients are constant over the time series in the stated model, therefore, the model is said to be stable if the Eigen values are in the circle, thus all Eigen values are in the circle except one on the line, it is concluded that the model is stable and the coefficients are constant.

4.2.8. OLS Estimation of Coefficients

Table 4.6Regression Results

Number of obs. = 28
F(5, 22) = 194.7R-squared =0.977
Prob > F = 0.0000 Adj R-squared = 0.972

PCGDP	**Coef**	**Std.Err**	**t**	**P>(t)**	**(95% Conf.Int)**	
DDO	0.029	0.00046	6.31	0.000	.019	.038
EDO	0.0053	0.0026	1.97	0.62	-0.0028	0.019
EDS	-.003	0.0089	-0.4	0.0694	-0.0221	0.014
NLR	.229	4.57	0.05	0.96	-9.225	9.7
EXP	.046	0.019	2.34	0.028	0.0053	0.195
_CONS	2.09	50.09	0.04	0.967	-101.79	105.98

From the estimation results, there was evidence of statistical significance of domestic debt and exports, in explaining economic growth in the long-run; however the external debt stock& external debt service had insignificant long run and short run relationship with economic growth.

The signs of the estimated coefficients were also consistent with the expectation from economic theory; Export and domestic debt were found to affect economic growth positively, whereas Nominal Lending rate and external debt stock had positive but insignificant effect on economic growth. Furthermore, external debt servicing had negative but insignificant effect on Per Capita GDP.

The signs of their corresponding coefficients show consistency with expectation from economic theory. The coefficient of determination, Adj-R-squared (0.972) indicated that the independent variables accounted for around 97.2 percent of the variations in Per Capita GDP, on the. Similarly, the p-value (0.000) of the F-statistic indicated that the overall model was significant in explaining the relationship.

Moreover, the confidence intervals of Domestic debt, and export has non-zero value at 95% , therefore, there is 95% confidence of these variables stated above to have non-zero value estimates of the population parameters. The external debt servicing has negative confidence interval, holds zero value at 5% significance level.

The significant positive effect of domestic debt stock in Ethiopia (0.029) on economic growth concurs with Keynesian hypothesis on tax cut that states there is influence both in the short and long run on consumption to boost aggregate demand and economic growth. Moreover, the result concurs with empirical studies done by, Mohammed,(2010) who found domestic debt has positive relationship with economic growth and PETER N. MBA et.al (2013) who came to the same conclusion in Nigeria's domestic debt has direct positive impact on economic growth and Amaru et.al (2013) found external debt possessed a negative impact on economic growth while domestic debt has impacted positively on economic growth (GDP).

Negative but statistically insignificant effect of external debt servicing on economic growth showed that there is no evidence to explain crowding out effect on Ethiopian investment. Possible reasons to explain its insignificance result might be debt relief from lenders and the characteristics of loan provided which was concessional that might have reduced the impact of debt on the economy. External debt has insignificant positive impact on economic growth so both its positive effect or negative effect characterized by debt overhang cannot be confirmed.

Moreover, most of the studies in developing countries have shown both negative and positive significant impact.

Export has significant positive impact on economic growth in which 100 USD export bill will induce 4.6 USD on economic Per Capita GDP.

CHAPTER FIVE

Conclusions and Policy Recommendations

5.1. Conclusions

The overall objective of the study is to determine the impact of Public debt on Ethiopian economy during the indicated period. To find the long run relationship Vector Error Correction Model was deployed, after necessary statistical tests were conducted.

According to the empirical findings, debt servicing was found to impact Ethiopian economic growth negatively but insignificantly, it opens discussion on how it happens. Ethiopian economy has been showing increasing trend regardless of low export, and tax, which has effects on the amount of money needed to finance ambitious plan of government led investment. Low export has an effect on debt servicing and recently export bill declined becoming questionable to service foreign debt.

High demand in foreign finance due to dependency of capital goods to implement projects, with low export bill that is used both to implement investment projects and debt servicing , put the country in difficult macro-economic situation. IMF, debt sustainability analysis report (2019) rank the country as high risk borrower because of low performance in export and decline in timely completion of SOE export oriented projects

Ethiopia had been entertaining debt relief and debt restructuring so far before the HIPC and other debt relief schemes were terminated. Moreover, Ethiopia's debt is characterized by low interest rate and longer maturity period that enabled the country to pay less amount of money that made country to redirect its resources towards economic activities that can be the possible reason why there is insignificant effect of debt servicing on economic growth. However, it needs in depth study to confirm why it happened.

This result deviated from the work of Iyoha (1999) who came to conclude negative impact of debt servicing in Sub-Saharan countries, similarly Achieng (2010) had the same conclusion as Iyoha in which debt servicing has negative impact on economic growth, and most of the researchers in developing countries came to the same conclusion and ,moreover, external debt

outstanding was statistically insignificant to explain Per capita GDP so it is difficult to confirm debt overhang situation or its contribution to the economy.

Domestic debt had also impacted economic growth positively and significantly, and this is the first result in case of Ethiopia, and it c be concluded that there is crowding out effect on private investment since most of government financing sources were its own institutions and banks, its positive impact on growth and its positive conclusion is mainly due to government poverty oriented and welfare scheme which holds more than, on average, 60 % of the total expenditure.

The result deviates from the research conducted by-Akram(2015) found negative impact of domestic debt on economic growth but concurs with work of Peter. Et.al(2013)and Muhammad(2009) concluded that domestic debt had positive impact on economic growth.

Generally domestic debt was found to be significant to affect economic growth positively. However, external debt and debt servicing has insignificant impact possibly because ample amount of money had been in written-off during HIPC program and redirected to government budget. The characteristics of Ethiopian loan are mainly concessional; this means that, low interest bearing loan and longer maturity which enabled the country pay slight amount of debt annually. Furthermore, rescheduling has been another possible reason for the reduced impact on the economy.

5.2. Policy Recommendations

Following the findings below are the policy implications arising from this study;

- Domestic debt was found to have positive impact on the economy and is now becoming an alternative financing government
- Government needs to utilize external debt effectively and efficiently.
- Debt servicing should be at it its optimal level not to crowd out investment since export is declining. This is more critical when there is no debt relief and restructuring that relates with policy sovereignty.
- Moreover, government should not run in to any additional external debt schemes with out considering the return.

5.3. Future Research Suggestions

There is need to conduct a research other effects of domestic debt on economic growth in Ethiopia more detail than those covered in this study. Furthermore, there is also a need to undertake studies on impact of debt relief on economic growth in Ethiopia to see how much it contributed to reduce burden from the economy so as to compare and corroborate the results of this study.

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Appendices

Appendix-1 Data Used in Descriptive analysis and model estimation

Multilateral Loan Situation

Multilateral Loan Situation			Bilateral			
Institution	**Maturity Date/year**	**Interest Rate/%**	**Country**	**Grace Period**	**Maturity Period**	**Interest Rate/%**
IFC	6	0.75	Italy	20	**30**	0
ADB	10	0.75	S.Korea	10	40	0.1
IADF	10	0.75	Japan	10	40	0.1
OPEC	5	1	France	5-7	20-25	1.2-1.7
BADIYA	10	1	Saudi Arabia	7	25	1
EIB	4	0.75	Poland	5	33	0.35
			Kuwait and Abudabi	5-7	20	1

Source: Ministry of Finance

DSA Indicators

Indicators	Policy and institutional strength		
	Low	**Medi**	**strong**
PVdebt/GDP	30%	40%	50%
PVdebt/exports	100%	150%	200%
Debt service/exports	15%	20%	25%
PVdebt/budget revenue	200%	250%	300%
Debt service/budget revenue	25%	30%	35%

Source: Heavily Indebted Poor Countries Capacity Building Programme Document (2009)

Debt Sustainability Indicators of Ethiopia

S.No	DSA/External Debt	Threshold	DSA Result (2019)	Remark
1	PV of Debt/GDP	40	20.4	Sustainable
2	PV of Debt/Export	180	236.2	Critical
3	Debt Service /Exports	15	16.5	Critical
4	Debt Service /Revenue	18	11	Sustainable
5	**Total Debt (Domestic &External) /GDP**	56	44.2	Sustainable

Source: Ministry of Finance

Data and variables used for the study

Year	PCGDP	DDO	EDO	EDS	NLR	EXP
1991.00	219.18	4255.60	9100.00	280.00	6.80	276.38
1992.00	230.56	4812.30	8784.30	114.55	6.80	74.75
1993	211.80	1630.12	9003.15	100.22	14.90	186.25
1994	113.81	1732.70	9490.20	119.25	14.00	228.17
1995	123.07	1878.53	9967.60	138.87	14.58	453.62
1996	132.15	2152.31	9786.30	304.34	15.08	413.17
1997	137.55	2323.00	9635.80	107.10	15.50	598.69
1998	134.99	2408.74	9733.60	125.61	11.60	603.73
1999	130.70	2505.75	10130.60	130.93	11.75	483.04
2000	135.11	3227.40	5394.30	152.97	12.00	490.00
2001	131.26	3307.52	5478.70	91.48	12.75	460.00
2002	122.09	3223.51	6210.00	89.25	10.75	460.00
2003	130.76	3356.62	6782.24	107.00	10.75	482.05
2004	149.50	3608.20	7096.02	99.00	10.75	599.78
2005	178.39	4659.48	5598.14	108.67	10.50	847.38
2006	214.48	5678.60	5676.27	108.26	10.50	1000.40
2007	267.44	7032.30	2033.09	99.38	10.50	1185.12
2008	355.22	8650.84	2521.40	88.67	11.50	1465.75
2009	414.94	8561.00	3365.43	77.16	12.25	1448.03
2010	373.26	8100.35	4357.63	111.28	12.25	2003.27
2011	389.18	8410.20	5765.29	241.88	11.88	2750.16
2012	510.35	10958.92	6777.42	412.07	11.88	3166.00
2013	549.50	12769.41	8598.59	567.30	11.88	3097.84
2014	639.60	15713.28	10716.47	66.75	11.88	3295.70
2015	690.90	14994.20	14904.69	482.60	11.88	3018.46

Year	PCGDP	DDO	EDO	EDS	NLR	EXP
2016	815.00	17350.40	17753.14	659.88	12.75	2868.53
2017	876.00	20464.00	20973.00	809.60	12.75	2907.47
2018	883.00	23553.00	22760.00	954.23	13.50	2840.74

Source: Ministry of Finance (Statistical bulletin) & National Bank of Ethiopia

Appendix -2 Model test results

```
. dfuller DPCGDP, lags(0)

)ickey-Fuller test for unit root                  Number of obs   =        26

                                 ———— Interpolated Dickey-Fuller ————
                    Test         1% Critical       5% Critical      10% Critical
                  Statistic          Value             Value            Value
——————————————————————————————————————————————————————————————————————————
 Z(t)              -3.173            -3.743            -2.997           -2.629
——————————————————————————————————————————————————————————————————————————

facKinnon approximate p-value for Z(t) = 0.0216

. dfuller DPCGDP, trend lags(0)

)ickey-Fuller test for unit root                  Number of obs   =        26

                                 ———— Interpolated Dickey-Fuller ————
                    Test         1% Critical       5% Critical      10% Critical
                  Statistic          Value             Value            Value
——————————————————————————————————————————————————————————————————————————
 Z(t)              -4.900            -4.371            -3.596           -3.238
——————————————————————————————————————————————————————————————————————————

facKinnon approximate p-value for Z(t) = 0.0003
```

```
 dfuller DDO, lags(0)

ickey-Fuller test for unit root                   Number of obs   =        27

                         ------------ Interpolated Dickey-Fuller -----------
               Test         1% Critical       5% Critical      10% Critical
             Statistic           Value             Value            Value
------------------------------------------------------------------------------
Z(t)            3.398          -3.736            -2.994           -2.628
------------------------------------------------------------------------------
acKinnon approximate p-value for Z(t) = 1.0000

 dfuller DDO, trend lags(0)

ickey-Fuller test for unit root                   Number of obs   =        27

                         ------------ Interpolated Dickey-Fuller -----------
               Test         1% Critical       5% Critical      10% Critical
             Statistic           Value             Value            Value
------------------------------------------------------------------------------
Z(t)           -0.064          -4.362            -3.592           -3.235
------------------------------------------------------------------------------
acKinnon approximate p-value for Z(t) = 0.9935

dfuller DDDO, lags(0)

.ckey-Fuller test for unit root                   Number of obs   =        26

                         ------------ Interpolated Dickey-Fuller -----------
               Test         1% Critical       5% Critical      10% Critical
             Statistic           Value             Value            Value
------------------------------------------------------------------------------
:(t)           -3.138          -3.743            -2.997           -2.629
------------------------------------------------------------------------------
cKinnon approximate p-value for Z(t) = 0.0239

dfuller DDDO, trend lags(0)

.ckey-Fuller test for unit root                   Number of obs   =        26

                         ------------ Interpolated Dickey-Fuller -----------
               Test         1% Critical       5% Critical      10% Critical
             Statistic           Value             Value            Value
------------------------------------------------------------------------------
:(t)           -5.548          -4.371            -3.596           -3.238
------------------------------------------------------------------------------
cKinnon approximate p-value for Z(t) = 0.0000
```

```
dfuller EDO, lags(0)

ickey-Fuller test for unit root                    Number of obs   =        27

                               ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
Z(t)               1.893            -3.736            -2.994            -2.628
------------------------------------------------------------------------------
acKinnon approximate p-value for Z(t) = 0.9985

dfuller EDO, trend lags(0)

ickey-Fuller test for unit root                    Number of obs   =        27

                               ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
Z(t)               1.595            -4.362            -3.592            -3.235
------------------------------------------------------------------------------
acKinnon approximate p-value for Z(t) = 1.0000

dfuller DEDO, lags(0)

ickey-Fuller test for unit root                    Number of obs   =        26

                               ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
Z(t)              -3.203            -3.743            -2.997            -2.629
------------------------------------------------------------------------------
acKinnon approximate p-value for Z(t) = 0.0198

dfuller DEDO, trend lags(0)

ickey-Fuller test for unit root                    Number of obs   =        26

                               ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
Z(t)              -4.372            -4.371            -3.596            -3.238
------------------------------------------------------------------------------
acKinnon approximate p-value for Z(t) = 0.0024
```

```
. dfuller EDS, lags(0)

)ickey-Fuller test for unit root                   Number of obs   =        27

                         ------------ Interpolated Dickey-Fuller ------------
               Test         1% Critical       5% Critical      10% Critical
             Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)          -4.914            -3.736            -2.994           -2.628
------------------------------------------------------------------------------
fackKinnon approximate p-value for Z(t) = 0.0000

. dfuller EDS, trend lags(0)

)ickey-Fuller test for unit root                   Number of obs   =        27

                         ------------ Interpolated Dickey-Fuller ------------
               Test         1% Critical       5% Critical      10% Critical
             Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)          -4.836            -4.362            -3.592           -3.235
------------------------------------------------------------------------------
fackKinnon approximate p-value for Z(t) = 0.0004

 dfuller DEDS, lags(0)

ickey-Fuller test for unit root                    Number of obs   =        26

                         ------------ Interpolated Dickey-Fuller ------------
               Test         1% Critical       5% Critical      10% Critical
             Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)          -8.365            -3.743            -2.997           -2.629
------------------------------------------------------------------------------
acKinnon approximate p-value for Z(t) = 0.0000

 dfuller DEDS, trend lags(0)

ickey-Fuller test for unit root                    Number of obs   =        26

                         ------------ Interpolated Dickey-Fuller ------------
               Test         1% Critical       5% Critical      10% Critical
             Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)          -8.196            -4.371            -3.596           -3.238
------------------------------------------------------------------------------
acKinnon approximate p-value for Z(t) = 0.0000
```

```
. dfuller NLR, lags(0)

ickey-Fuller test for unit root                   Number of obs   =        27

                         ------------ Interpolated Dickey-Fuller ------------
               Test         1% Critical       5% Critical      10% Critical
             Statistic           Value             Value            Value
------------------------------------------------------------------------------
Z(t)           -3.543           -3.736            -2.994           -2.628
------------------------------------------------------------------------------
acKinnon approximate p-value for Z(t) = 0.0069

. dfuller NLR, trend lags(0)

ickey-Fuller test for unit root                   Number of obs   =        27

                         ------------ Interpolated Dickey-Fuller ------------
               Test         1% Critical       5% Critical      10% Critical
             Statistic           Value             Value            Value
------------------------------------------------------------------------------
Z(t)           -3.475           -4.362            -3.592           -3.235
------------------------------------------------------------------------------
acKinnon approximate p-value for Z(t) = 0.0421

. dfuller DNLR, lags(0)

ickey-Fuller test for unit root                   Number of obs   =        26

                         ------------ Interpolated Dickey-Fuller ------------
               Test         1% Critical       5% Critical      10% Critical
             Statistic           Value             Value            Value
------------------------------------------------------------------------------
Z(t)           -5.585           -3.743            -2.997           -2.629
------------------------------------------------------------------------------
acKinnon approximate p-value for Z(t) = 0.0000

. dfuller DNLR, trend lags(0)

ickey-Fuller test for unit root                   Number of obs   =        26

                         ------------ Interpolated Dickey-Fuller ------------
               Test         1% Critical       5% Critical      10% Critical
             Statistic           Value             Value            Value
------------------------------------------------------------------------------
Z(t)           -5.612           -4.371            -3.596           -3.238
------------------------------------------------------------------------------
acKinnon approximate p-value for Z(t) = 0.0000
```

```
 dfuller EXP, lags(0)

ickey-Fuller test for unit root                   Number of obs   =        27

                                 ------------ Interpolated Dickey-Fuller ------------
                    Test         1% Critical       5% Critical      10% Critical
                  Statistic           Value             Value            Value
------------------------------------------------------------------------------
Z(t)                -0.071           -3.736            -2.994           -2.628
------------------------------------------------------------------------------
acKinnon approximate p-value for Z(t) = 0.9523

 dfuller EXP, trend lags(0)

ickey-Fuller test for unit root                   Number of obs   =        27

                                 ------------ Interpolated Dickey-Fuller ------------
                    Test         1% Critical       5% Critical      10% Critical
                  Statistic           Value             Value            Value
------------------------------------------------------------------------------
Z(t)                -1.629           -4.362            -3.592           -3.235
------------------------------------------------------------------------------
acKinnon approximate p-value for Z(t) = 0.7810

dfuller DEXP, lags(0)

ckey-Fuller test for unit root                    Number of obs   =        26

                                 ------------ Interpolated Dickey-Fuller ------------
                    Test         1% Critical       5% Critical      10% Critical
                  Statistic           Value             Value            Value
------------------------------------------------------------------------------
(t)                 -3.378           -3.743            -2.997           -2.629
------------------------------------------------------------------------------
cKinnon approximate p-value for Z(t) = 0.0117
```

```
veclmar
```

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	28.6536	36	0.80311
2	42.4393	36	0.21319

H0: no autocorrelation at lag order

```
vecrank PCGDP DDO EDO EDS NLR EXP, trend(constant) lags(1) max
```

Johansen tests for cointegration

Trend: constant — Number of obs = 27
Sample: 1992 - 2018 — Lags = 1

Maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	6	-1076.2295	.	125.4334	94.15
1	17	-1055.0572	0.79160	83.0888	68.52
2	26	-1038.658	0.70322	50.2904	47.21
3	33	-1026.1501	0.60407	25.2746*	29.68
4	38	-1018.4994	0.43262	9.9732	15.41
5	41	-1013.9395	0.28664	0.8534	3.76
6	42	-1013.5128	0.03111		

Maximum rank	parms	LL	eigenvalue	max statistic	5% critical value
0	6	-1076.2295	.	42.3446	39.37
1	17	-1055.0572	0.79160	32.7983	33.46
2	26	-1038.658	0.70322	25.0158	27.07
3	33	-1026.1501	0.60407	15.3015	20.97
4	38	-1018.4994	0.43262	9.1198	14.07
5	41	-1013.9395	0.28664	0.8534	3.76
6	42	-1013.5128	0.03111		

Vector error-correction model

Sample: 1992 - 2018		Number of obs	= 27
		AIC	= 78.45556
Log likelihood = -1026.15		HQIC	= 78.92651
Det(Sigma_ml) = 4.13e+25		SBIC	= 80.03936

Equation	Parms	RMSE	R-sq	chi2	P>chi2
D_PCGDP	4	33.8785	0.6489	40.66316	0.0000
D_DDO	4	1126.56	0.5281	24.62356	0.0001
D_EDO	4	1638.27	0.5338	25.18746	0.0000
D_EDS	4	929.573	0.5825	30.692	0.0000
D_NLR	4	1.85541	0.1214	3.040685	0.5510
D_EXP	4	218.032	0.2981	9.342335	0.0531

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
D_PCGDP						
_ce1						
L1.	-.2999953	.0743191	-4.04	0.000	-.4456581	-.1543326
_ce2						
L1.	.0100253	.0021552	4.65	0.000	.0058011	.0142495
_ce3						
L1.	-.0010071	.0010473	-0.96	0.336	-.0030597	.0010456
_cons	-28.90495	13.66684	-2.11	0.034	-55.69148	-2.118432
D_DDO						
_ce1						
L1.	-3.285959	2.471335	-1.33	0.184	-8.129686	1.557769
_ce2						
L1.	.1430975	.0716684	2.00	0.046	.0026302	.2835649
_ce3						
L1.	.0436823	.0348249	1.25	0.210	-.0245733	.1119379
_cons	5.294201	454.464	0.01	0.991	-885.4388	896.0272
D_EDO						
_ce1						
L1.	-1.304515	3.593869	-0.36	0.717	-8.348368	5.739338
_ce2						

D_EDO						
	_ce1					
	L1.	-1.304515	3.593869	-0.36	0.717	-8.348368	5.739338
	_ce2					
	L1.	.1548853	.1042217	1.49	0.137	-.0493854	.359156
	_ce3					
	L1.	.0899686	.0506432	1.78	0.076	-.0092901	.1892274
	_cons	-2.567514	660.8913	-0.00	0.997	-1297.891	1292.756
D_EDS						
	_ce1					
	L1.	-1.358744	2.039198	-0.67	0.505	-5.355498	2.63801
	_ce2					
	L1.	-.0143369	.0591364	-0.24	0.808	-.1302422	.1015683
	_ce3					
	L1.	.075342	.0287354	2.62	0.009	.0190215	.1316624
	_cons	-.9876587	374.9965	-0.00	0.998	-735.9673	733.9919
D_NLR						
	_ce1					
	L1.	.005827	.0040702	1.43	0.152	-.0021505	.0138044
	_ce2					
	L1.	-.0001387	.000118	-1.18	0.240	-.00037	.0000927
	_ce3					
	L1.	.0000567	.0000574	0.99	0.323	-.0000557	.0001691

```
regress PCGDP DDO EDO EDS NLR EXP
```

Source	SS	df	MS	Number of obs	=	28
				F(5, 22)	=	194.97
Model	1635124.74	5	327024.948	Prob > F	=	0.0000
Residual	36901.396	22	1677.33618	R-squared	=	0.9779
				Adj R-squared	=	0.9729
Total	1672026.14	27	61926.894	Root MSE	=	40.955

PCGDP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
DDO	.0292086	.0046294	6.31	0.000	.0196078	.0388093
EDO	.0053175	.0026999	1.97	0.062	-.0002818	.0109168
EDS	-.0035626	.0089348	-0.40	0.694	-.0220923	.014967
NLR	.229249	4.573446	0.05	0.960	-9.255497	9.713995
EXP	.0460427	.0196368	2.34	0.028	.0053184	.086767
_cons	2.096545	50.09595	0.04	0.967	-101.7961	105.9892

```
. vecnorm, jbera
```

Jarque-Bera test

Equation	chi2	df	Prob > chi2
D_PCGDP	0.682	2	0.71112
D_DDO	1.749	2	0.41703
D_EDO	0.345	2	0.84161
D_EDS	0.398	2	0.81942
D_NLR	0.592	2	0.74381
D_EXP	2.773	2	0.24989
ALL	6.540	12	0.88648

Eigen Value	MODULUS
1	
1	
1	
1	
.5666659 + .1805177i	.594724
.5666659 + .1805177i	.594724
.1329902 + .4593687i	.478232
.1329902 + .4593687i	.478232
-.2987211 + .332273i	.44681
-.2987211 + .332273i	.44681

The VECM specification imposes 4 unit moduli.