Journal of Economics and Sustainable Development
ISSN 2222-1700 (Paper) ISSN 2222-2855 (Online)
Vol.11, No.11, 2020

The Impact of Public External Debt on Economic Growth in Ethiopia: The ARDL Approach to Co-integration

Berhanu Getinet[1] Fikadu Ersumo[2]
1. Assistant professor , Department of economics, Hawassa University, Ethiopia
2. Lecturer, Department of economics, Wochamo University, Ethiopia

Abstract
Governments need extensive amount of capital funding to achieve the sustainable economic growth. And due to lack of adequate capital, most developing countries such as Ethiopia rely on borrowings from external sources to bridge the resource gap. This study aims to analyze the impacts of public external debt on economic growth in Ethiopia by ARDL approach using a time series annual data from 1983-2018. The model considers annual GDP growth rate as a dependent variable. The debt variables including public external debt stock to GDP (PEDSGD), the ratio of debt service stock to GDP (DSSGD) and debt service stock to export (DSSEXP) and other macroeconomic variables such as trade openness(TRD), rate of inflation(INFL) and public expenditure to GDP ratio(NEXPGD) are explanatory variables. The study used bound testing for co-integration in the long-run and ECM for short-run dynamics. The study showed long-run co-integration, while the speed with which the disequilibrium caused by lack of proper management external fund in earlier years returns to long-term equilibrium is 60.96% in the current year as indicated by coefficient of error correction term. The result of this study revealed that the variables PEDSGD and DSSGD are significant debt variables and have the negative impact on economic growth of Ethiopia in long run and short run. The other debt variable, DSSEXP negatively affects economic growth and is significant but only in the short run. This shows that there is the evidence of crowding out effect of public external debt in the short run. Also, the negative sign and statistical significance of the variable DSSGD shows that there is debt overhung effect of public external debt in the country. The negative impact is probably due to lack of proper management and/or investments of the funds borrowed from external sources into unproductive activities and projects. As a result government should properly allocate its external debt for the productive investment and maintain proper and efficient debt management policy.
Keywords: Public external debt, Debt service, Debt Overhang, Debt Crowding out, Economic Growth, ARDL
DOI: 10.7176/JESD/11-11-03
Publication date: June 30th 2020

1. INTRODUCTION

Economic growth is one of major goals of macroeconomic policy of nations. To achieve this goal, governments require substantial amount of capital to finance investment expenditures on infrastructural and productive capacity development (Umaru et al, 2013). But the amount of capital available in most developing economies treasury is not adequate to meet their growth needs mainly due to their low productivity, low savings and high consumption and pattern current account deficit (Ayadi and Ayadi, 2008).

The developing economies facing deficit usually do borrow from developed countries as well as an international community to bridge their resource gap and finance their economic growth. Tashome(2015) argues that developing countries with low domestic mobilization capacity relay more on external loans and grants. And such external borrowings by these countries are meant to complement the domestic savings and allow them to make productive investments (Ezeabasili et al., 2011). Similarly, Obudah and Tombofa (2013) argue that countries may borrow to finance their reoccurring budget deficit, for deepening their financial markets, to enable them increase government expenditures, to widen their narrow revenue sources and improve productivity which in turn can improve economic growth. Besides, Gohar and Butt (2012) commended that countries get debt from the external sources due to budget deficit or they are having low investments. This fact is supported by the dual-gap theory of Chenery that governments borrow to augment their limited resources so as to bridge the gap of savings and investment(Chenery,1966).

The Keynesian macro economics explains that government borrowings can be used to promote economic growth through the financing of government deficit expenditures which stimulates aggregate demand and thus encourage investments. However, excessive public debt can create great debt burden for a country which may hamper the economic growth. Once the initial stock of debt grows to a certain threshold, servicing them becomes a burden with debt crowding out investment and growth(Soludo,2003; Okonjo-Iweala et al, 2003). Conversely, there is an assertion that a country's indebtedness does not necessarily slow growth, rather it is the nation's inability to optimally utilize these loans to foster economic growth and ensure effective servicing of such debt that hampers the benefits derivable from external borrowed resources(Bakare,2011). Indeed, public external debt is risky if the debt by far exceed a sustainable level and national repayment capabilities. The main cost associated with public foreign borrowings is the debt service cost, which is a very expensive tax bill that developing

economies must pay from their future income. And, it accounts for fixed contractual charges on savings, income, and foreign reserves(Sami and Mbah,2018).

African Development Bank(2010) reported that the public external debt becomes a major concern of highly indebted poor countries (HIPCs) and affected their economic fundamentals since 1970s oil crisis. It has been argued that higher public external debt to GDP ratio increases the chances of a crisis and enhances volatility, lowering growth.World Bank(2015) reported that Ethiopia's external debt has changed significantly in magnitude and the country is one of highly indebted poor countries in the world. At the same time, the country has been registering robust growth over the last three decades with some fluctuations across different time periods.

The issue of public external debt becomes burning for developing Sub-Saharan African countries such as Ethiopia and needs to be researched for proper management and efficient utilization for fostering economic growth. Therefore, the objective of this study is to investigate the impact of public external debt on economic growth of Ethiopia using a time series data(1983-2018). The study enables policy makers to understand the long-run and short-run impact of public external debt and economic growth so as they can take appropriate policy measures. It enables to determine whether there exist public external debt overhang problem and/or crowding out effect.

2. STATEMENT OF THE PROBLEM

One of the common problems facing many Sub-Saharan African countries, in general and Ethiopia in particular is their highly indebtedness beyond their repayment capacities. The public external debt problem is becoming more acute for a number of reasons. First, the size of the debt relative to the size of the economy is enormous that can lead not only to capital flight, but also may discourage private investment. Secondly, debt servicing payments take a significant proportion of the annual export earnings. Meeting debt servicing obligations ruin the resources of the country significantly, which otherwise would be used for financing other basic services and improve the welfare of the citizens. Thirdly, the burden of debt for a large number of Sub-Saharan African countries threatens not only the execution and success of adjustment programs being embarked upon. Fourth, the existing system of debt management has a dire macroeconomic impact on an economy's level of income (Ajayi and Khan,2000).

The public external debt has adverse impact on macro economic balance of an economy. According to Mulugeta (2014) the high growth of debt and indebtedness usually indicated by accumulation of interest and principal arrears, has changed the ability of the country to meet its obligations. It would be extremely difficult to attain long run sustainable growth, if not impossible, without addressing the debt overhang problem. There are multidimensional channels through which debt overhang is translated in to a drag on growth. Firstly, the burden of principal and interest payments drains the nation's resource and curtails the possible expenditure of resources on other productive ventures. Second, a raising external debt contracted on floating rates leads to a rising debt service. This will have great implications on resource utilization and hence economic growth. Third, the size of debt burden relative the size of economy can cause capital flight and discourage private investors viewing the debt as anticipated foreign tax on future income and returns on investment.

Ethiopia is among one of the highly indebted countries in the world and even Sub-Saharan Africa(World Bank,2015). The public external debt of Ethiopia has been increasing in the last decades. Recently, the country's external debt stock has reached USD 26.4 billion in 2017/18, with 11.3 percent annual growth mainly due to higher debt owed to multilateral and commercial creditors of the world. As a result, the country's external debt stock to GDP ratio stood at 28.9 percent(NBE,2018). The Ethiopian government since 1990's has introduced a more liberalized market-based economic policy with significant institutional reforms in view of reviving and accelerating the country's economic growth. Despite the debt burden, the economic performance of the country was improving during this period, relative to the situation in the 1980s. The real GDP grew on average by 5 percent per annum compared to the 2 percent average growth in the 1980s. But since 1991, real GDPGR revealed an outstanding increase and grew on average by 6.58 % per annum. In the recent years (2014-2018), economy was growing at quicker rate; average real GDP growth rate of 9.42 %. Indeed, the economy registered 7.7 percent growth in 2017/18, slower than the 10.9 percent expansion recorded in the previous year (NBE,2018).

The effect of this external debt on economic growth continues to attract considerable interest from policymakers and scholars. However, scholars did not agree on its effect on economic growth. There are certain empirical studies that have been conducted regarding the relationship between public external debt and economic growth, even if, they end up with different conclusive results. In this regard, Al-Zeaud (2014) analyzed granger Causality and found positive effect of external debt on economic growth in Jordan economy. However, the study by Sami and Mbah (2018) which employed ARDL co-integration approach revealed a negative and significant influence of external debt on economic growth in emerging economy of Oman. The study by Karagol(2002) for economy of Turkey used multivariate co-integration techniques and found negative relationship between external debt and economic growth. Were (2001) conducted a time series study on the impact of external debt on economic growth in Kenya indicated that public external debt accumulation has a negative impact on economic growth causing a debt overhang problem. Likewise, Udoh et.al.(2020) with the ARDL model found negative effect of intergenerational debt burden on economic growth in Nigeria. But the study conducted in Bangladesh by Shah and

Pervin (2012) employing ARDL approach showed the positive impact of public external debt on economic growth. The study on effect of external debt on economic growth in Sub-Saharan Africa (SSA) was conducted by Bernardin, et.al (2018) with frontier econometric techniques of the GMM approach and it found that public external debt negatively affects economic growth in the region. Moreover, Onakoya and Ogunade(2017) conducted a study on Nigerian economy with bound testing approach using the Ordinary Least Squares technique and found that public external debt is related to economic growth is negatively . Nantwi and Erickson (2016) examined the relationship between public debt and economic growth in Ghana using Johansen co-integration approach and the vector error correction model and reported that a positive and statistical significant relationship between public debt and economic growth. In Ethiopian economy, the results of the empirical studies by Ramakrishna (2002) employed Johansen co-integration approach and Gebrekidan et al. (2013) and Kassu et al.(2014) using time series data found negative effect of public external debt on economic growth of the country. In contrary, study by Befekadu(1992) found that debt accumulation relates positively to economic growth. The relationship between the external debt and economic growth is debatable and inconclusive. The inconsistency in the study results, dynamic and context based nature of the relationship between public external debt and economic growth calls for the further researches on the issue. Thus, this study investigates the impact of public external debt on economic growth in Ethiopia which is helpful for determining whether debt overhang problem and/or crowding out effect hypothesis exists.

3. METHODOLOGY OF THE STUDY

Types and Sources of data

The study solely relies on secondary data of 35 years for the period 1983 to 2018. The sources include Ministry of Finance(MoF), National plan Commission(NPC),CSA, National Bank of Ethiopia (NBE), the World Bank and IMF.

Model specification

To examine the impact of Public external debt on economic growth in Ethiopia, an open macroeconomic model is specified following (Chongo,2013). The study argued that a framework linking the various sectors of the economy were needed to be able to fully analyze the effect of public external debt on economic growth. Thus, national income identity model augmented with debt and monetary variables was employed. The model explores the relationship between external debt burden indicators and economic growth. First, the model of the economic growth can be expressed with the function:

$$\mathrm{GDPGR} = F(\mathrm{PEDSGD}, \mathrm{DSSG}, \mathrm{DSSEXP}, \mathrm{NEXPGD}, \mathrm{TRD}, \mathrm{INFL}) \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

And then, the empirical model of the study has been specified as:

$$\mathrm{GDPGRt} = \beta 0 + \beta 1\mathrm{PEDSGDt} + \beta 2\mathrm{DSSGDt} + \beta 3\mathrm{DSSEXPt} + \beta 4\mathrm{NEXPGt} + \beta 5\mathrm{TRDt} + \beta 6\mathrm{INFL} + U\mathrm{t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where ;

$\beta 0, \beta 1, \beta 2 \ldots\ldots, \beta 6$.=Parameters to be estimated in the model;

GDPGRt = Annual growth rate of real GDP;

PEDSGDt= Ratio of public external debt stock to GDP at time t

DSSGDt = Ratio of debt service stock to GDP at time t;

DSSEXPt = Ratio of debt service stock to export at time t;

NEXPGDt= Ratio of national expenditure to GDP;

TRDt = trade openness which is the ratio of sum of

INFLt= Rate of inflation at time t ;

Ut= White noise error term

In the study model, PEDSGD, DSSEXP and DSSGD are the three debt burden indicators. The implication is that the higher a country's PEDSGD, DSSEXP and DSSGD, the greater the debt burden that the economy experiences. Other macroeconomic variables such as national expenditure, rate of inflation and trade openness have been also incorporated in the model. The national expenditure here refers to the summation of private consumption expenditure, government consumption expenditure, and gross capital formation which is a form of investment

Model Estimation Procedure

The study adopted the Autoregressive Distributed Lag model (ARDL) or bound testing co-integration approach developed by Pesaran et al (2001) and Pesaran and Shin (1999) to estimate and examine long- run relationships among the variables in the model(co-integration) and the Error Correction Model (ECM) to analyse the effect economy's public external debt on its economic growth in short-run(short-run dynamics). The ARDL model has both lagged values of the dependent variables (autoregressive) and lagged values of the independent variables (distributed lag) as one of the explanatory variables. There are alternative models applied in the time series studies such as classical Engle-Granger approach (Engle and Granger,1987) and Johansen co-integration approach based on Johansen and Juselius (1990) for testing the presence of long run relationship among the variables. However, these approaches have some drawbacks. The Engle-Granger and Johansson co-integration approaches, for instance requires the underlying variables to be integrated of order one i.e. I (1). This implies that, the pretesting for

integration order is prior important step needed to determine long run co-integration relationships (Pesaran and Shin, 1997). In addition, Johansen's approaches based on maximum likelihood technique results an estimator which is asymptotically efficient and is exposed to small sample bias when applied to small sample size (Narayan,2005; Udoh and Ogbuag,2012)). Therefore, there is a need to look for an alternative co-integration approach that is applicable for small sample size such as ARDL.

The ARDL or bound testing approach has several advantages over the other approaches. Firstly, the model is a reduced single equation method that can be applied on a small sample size. In contrast to this, the Engle–Granger approach and Johansen co- integration approach estimate the long-run relationships from a system of equations and are fairly data intensive. According to Pesaran an Shin (1995), this approach results in unbiased estimates in the long run (and also the estimates obtained are relatively more efficient for finite and small sample size. Indeed, this avoids the problems that come as a result of serial correlation and endogenity(Pesaran et al, 2001). Secondly, ARDL is applicable even when the regressors are purely I (0) or purely I (1) or mutually integrated; so that it avoids the volatility associated with the pre-testing for the order of integration of variables. Thirdly, once the lag order of the model is obtained, it permits the co-integration relationship to be estimated by OLS and also is helpful to make a distinction among dependent and independent variables which allows investigating whether long-run relationship exists between them. Moreover, in ARDL the short-run and long-run coefficients of the model are estimated simultaneously (Pesaran and Shin, 1999).

The ARDL approach to co-integration involves estimating the unrestricted Error correction model (ECM) model and has been identified following Pesaran et al (2001) below as:

$$\begin{aligned}\triangle \text{GDPGRt} = {} & \beta 0 + \beta 1 \triangle \text{PEDSGDt} + \beta 2 \triangle \text{DSSGDt} + \beta 3 \triangle \text{DSSEXPt} + \beta 4 \triangle \text{NEXPGDt} + \beta 5 \triangle \text{TRD} \\ & + \beta 6 \triangle \text{INFL} + \beta 7 \,(\text{GDPGR})\text{t} - 1 + \beta 8 \triangle (\text{PEDSGD})\text{t} - 1 + \beta 9 \triangle (\text{DSSGD})\text{t} - 1 \\ & + \beta 10(\triangle \text{DSSEXP}) + \beta 11 \,(\text{NEXPGD})\text{t} - 1 + \beta 12 \triangle (\text{TRD})\text{t} - 1 + \beta 13(\text{INFL})\text{t} - 1 \\ & + \text{ECTt} - 1 \quad \ldots\ldots\ldots\ldots\ldots (3)\end{aligned}$$

ECT_{t-1} , is error correction term lagged by one period.

The optimal Lag length test has been conducted by estimating single equation VAR(Vector Autogressive) and by means of the lag length criteria which is (AIC) to obtain the optimal number of lags for each variable. This was followed by the estimation of a single equation unrestricted error correction model with the number of selected lags as shown in Equation (4). This equation is different from the unrestricted error correction model in Equation (3) which includes only lags of all the variables including the dependent variable.

$$\begin{aligned}\triangle \text{GDPGRt} = \beta 0 + {} & \sum_{i=0}^{p} \beta 1 \triangle (\text{GDPGRt})t - i \\ & + \sum_{i=0}^{\text{p}} \beta 2 \triangle (\text{PEDSGDt})t - i + \sum_{i=0}^{p} \beta 3 \triangle (\text{DSSGDt})t - i \\ & + \sum_{\text{i}=0}^{\text{p}} \beta 4 \triangle (\text{DSSEXPt})\text{t} - \text{i} + \sum_{\text{i}=0}^{\text{p}} \beta 5 \triangle (\text{NEXPGDt})\text{t} - \text{i} + \sum_{\text{i}=1}^{\text{p}} \beta 6 \triangle (\text{TRD})\text{t} - \text{i} \\ & + \sum_{\text{i}=1}^{\text{p}} \beta 7 \triangle (\text{INFL})\text{t} - \text{i} \\ & + \beta 8(GDPGRt)t - 1 + \beta 8(PEDSGDt)t - 1 + \beta 9(DSSGDt)t - 1 + \beta 10(DSSEXPt)t - 1 \\ & + \beta 11(NEXPGDt)t - 1 + \beta 12(TRD)t + \beta 13(INFL)t - 1 + Vt \ldots\ldots\ldots (4)\end{aligned}$$

The F-statistics is found by conducting Wald test on the coefficient of unrestricted ECT variables. The F-statistics is important for testing the existence of long run relationship in the model and compared with Pesaran critical value at 5% level of significance. If the F-statistics is above the upper bound value, we reject the null hypotheses of no co-integration among variables, if it falls below the lower bound value,we do not reject the null hypotheses of no co-integration and if it lies between the bounds, the result is inconclusive (Pesaran and Shin, 1999). When it is established that variables are co-integrated implying that there is a long-run or equilibrium relationship between them, in the short-run there may be disequilibrium. Error correction mechanism is used to correct the disequilibrium. That is, when there is evidence of a long-run relationship (co-integration) of the variables, the short-run dynamics can be derived by estimating the Error Correlation Term (ECT) with the specified lags as shown in Equation (5).

$$\begin{aligned}\triangle GDPGRt = {} & \beta 0 + \sum_{i=0}^{p} \beta 1 \triangle (GDPGRt)t - i + \sum_{i=0}^{p} \beta 2 \triangle (PEDSGDt)t - i + \sum_{i=0}^{p} \beta 3 \triangle (DSSGDt)t - \\ & i + \sum_{i=0}^{p} \beta 4 \triangle (DSSEXPt)t - i + \sum_{i=0}^{p} \beta 5 \triangle (NEXPGDt)t - i + \sum_{i=1}^{p} \beta 6 \triangle (TRD)t - i + \sum_{i=1}^{p} \beta 7 \triangle \\ & (INFL)t - i + \delta ECTt - 1 \ldots\ldots\ldots (5)\end{aligned}$$

Where ;

Δ is the first difference operator; p is the optimal lag length and all other variables remain the same in the model; ECT is the error correction term; δ in equation 5 represents the speed of adjustment while the other

coefficients ($\beta1, \beta2, \beta3 \ldots \beta7$)of the short-run equation are coefficients relating to the short-run dynamics of the model's convergence to equilibrium.

The error correction term (ECT) is the defined as in the following in equation(6):

$$ECTt = \Delta GDPGRt - \beta - \sum_{i=0}^{p} \beta1 \triangle (GDPGRt)t - i - \sum_{i=0}^{p} \beta2 \triangle (PEDSGDt)t - i - \sum_{i=0}^{p} \beta3 \triangle (DSSGDt)t - i - \sum_{i=0}^{p} \beta4 \triangle (DSSEXPt)t - i - \sum_{i=0}^{p} \beta5 \triangle (NEXPGDt)t - i - \sum_{i=1}^{p} \beta6 \triangle (TRD)t - i - \sum_{i=1}^{p} \beta7 \triangle (INFL)t - i \ldots\ldots (6)$$

Diagnostic Tests of the Model

Unit Root Test

In order to test for stationarity, a unit root testing was carried employing the Augmented Dickey- Fuller (ADF) test(1986) and Philips– Perron test static of Philip (1988) in this study . If the variables in the model are non-stationary, it will end up with spurious regression and the test statistics become asymptotically non normal. Even if, bound testing does not require pre-testing for a unit root, in the case of I (2) variables, the computed F-statistic for the existence of co-integration is not valid (Pesaran et al, 2001). Therefore, a unit root test is in the ARDL procedure might still be necessary in order to ensure that none of the variables is integrated of order two or beyond. The bound testing is based on the assumption that the variables are I(0) , I(1) or mixture of the two, not beyond. Then after, the computed value were compared with Mackinnon(1996) critical values to determine whether the series are stationary or not. Moreover, Philips–Perron test statistics has been conducted; and the test non-parametrically corrects for any serial correlation and hetroscedasticity in the errors(Ut) by modifying the Dickey-Fuller test. The ARDL model goes through two steps for estimating the long-run relationship after we know the order of integration of all variables (Pesaran et al., 2001). Firstly, the existence of long-run relationship among all variables in the model needs to be analyzed and secondly, the long-run and short-run coefficients of the variables would be estimated. Indeed, we run the second step if there is a long run co-integration relationship among the variables in the first step.

The possible forms of the ADF test would be stated in following forms of equations:

$$\triangle \mathrm{GDPGRt} = \delta \mathrm{GDPGRt} - 1 + \sum_{i=2}^{p} \beta i(\triangle \mathrm{GDPGR})t - i + Ut \ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

$$\triangle \mathrm{GDPGRt} = \beta 0 + \delta \mathrm{GDPGRt} - 1 + \sum_{i=2}^{p} \beta i(\triangle \mathrm{GDPGR})t - i + Ut \ldots\ldots\ldots\ldots\ldots (8)$$

Now we can rewrite the model expressed in equation(8) including an intercept (β0) as well as a time trend(β1) and we then get:

$$\triangle \mathrm{GDPGRt} = \beta 0 + \beta 1 T + \delta \mathrm{GDPGRt} - 1 + \sum_{i=2}^{p} \beta i(\triangle \mathrm{GDPGR})t - i + Ut \ldots\ldots (9)$$

From the above equations, equation (7) shows random walk without drift ,equation (8) random walk with drift and equation (9) shows random walk with drift and trends. β1 ,is the coefficient of a time trend series, δ is the coefficient of $\mathrm{GDPGRt} - 1$, p is the lag order of the autoregressive process and Ut is the white noise.

The variable of interest in ADF test would be δ and the hypothesis(null and alternative) for the test has been set as follows:

H0: δ = 0 (i.e. It indicates a unit root, and the series is non-stationary);

HA: δ < 0 (i.e. It indicates no unit root problem and the series is stationary).

In order to determine the lags of each variable in the ARDL model, the Akaike Information Criterion (AIC) was used as this criteria is often recommended for the sample size less than 80.

Normality test

For testing whether the series is normally distributed or not, Jarque-Bera normality test statistic was employed. In the test statistic the difference of both skewness and kurtosis of the series from the normal distribution was measured. If the probability value of Jarque-Bera statistics is less than 5%, then the residual are not normally distributed but if the probability value of the test is greater than 5%, then the residual are normally distributed.

Autocorrelation

It a problem in a time-series data when the errors associated with a given time period carry over time periods. The Breush-Godfrey Serial Correlation LM test was employed for testing the problem in the present study. If the probability value is less than 5%, then we can reject the null hypothesis that indicates that the model has serial correlation and otherwise, no serial correlation. The problem can be removed from the model by creating one period lag of the dependent variable or changing all the variables in to first difference indeed (Gujarati, 2004).

Hetroscedasticity test

Hetroscedasticity is a problem when variances of the errors are not constant and changes overtime. This study used the Breush-Pagan-Godfrey test to test the presence of hetroscedasticity. If the probability value is less than 5%,

then the model has hetroscedasticity and vice versa.

Omitted variable test

In order to test for variable omission, the study used the Ramsey's RESET test for omitted variables. It tests whether the model suffers from omitted variable bias or not. The decision rule is then to reject the null hypothesis if the p-value is less than the conventional significance value of 5%.

Stability Test

The stability tests of the long-run and short-run coefficients used in this study were CUSUM and CUSUM-OF-SQUARES. Both of the test statistics are plotted against the critical bound of 5% significance. If the plot of these statistics remain within the critical bound of the 5% level of significance, the null hypothesis that the coefficient vector is the same in every period would not be rejected. That is, all coefficients in the error correction model are stable

Causality Test

Granger causality test identifies the direction of causality between real GDP growth rate as the dependent variable and the independent variables in the model. The existence of co-integrating relationship among the variables indicates that there must be granger causality at least in one direction, though the direction is not known (Tsadikan, 2013). The ARDL model employed in this study doesn't need test for granger causality since it considers endogenity problem in the model (Kibrom,2013) and the long run effect can be captured by Error Correction Term and thus, the regressor granger causes the dependent variable and there would be uni-directional relationship.

Study variables and working hypothesis.

The variables and working hypothesis in the model has been discussed as below.

Dependent variable:

Growth rate of real GDP (GDPGR): The GDP growth rate measures the real annual economic output growth of a country in real terms.

Independent variables:

The Public External debt to GDP ratio (PEDSGD):.It compares a country's Public external debt to its total real economic output (RGDP) for a year and shows the effect of external debt that measures the indebtedness of the country. As indicated by Shabbir(2013),it shows country's inability to meet its external debt obligations that adversely affect economic prosperity and causes debt overhang. A higher ratio indicates a country is not producing enough to pay off its debt and a lower ratio implies large economic output to make the payments.

The ratio of debt service stock to GDP **(DSSGD):** It is the ratio of country's debt service payments (principal + interest) to its GDP. According to Krugman (1989), if debt level exceeds the country's repayment ability, debt service is likely to be an increasing function of the country's output level. The returns from investment in the domestic economy have been 'taxed' away by foreign creditors. It is a proxy for debt overhung problem and thus expected to affect economic growth negatively.

Debt Service to Export Ratio (DSSEXP): It is another debt servicing variable expected to have negative effect on economic growth. It is expressed as percentage of exports for that year and argued that external debt service burden has a negative impact on investment and capital accumulation(clements et al.,2005). The reason is that the greater percentage of capital and foreign currency reserves goes to meet debt service and there will be a reduction in domestic resources as it is transferred to principal and interest payments that in turn leads to poor trade performance. If foreign creditors rather than domestic agents benefit from the rise in productivity, it discourages the economy to increase capital or labour for producing export items(Karagol, 2002). The servicing of external debt erodes the foreign exchange for imports and causes liquidity constraint and it is the proxy for crowding out effect of debt burden(Alemayehu,1998).

Ratio of national expenditure to GDP (NEXPGD): National expenditure refers to the summation of private consumption, government consumption expenditure, and gross capital formation which is a form of investment. It has been taken as the ratio of GDP in the study. This variable is expected to positively affect on the economic growth of a country(Mbah et al.**,** 2016**).**

Trade Openness (TRD) : The openness measured by the ratio of the sum of export and import to GDP and expected to affect economic growth positively. If economies are more open to trade, they have greater possibility to implement prominent technologies from other countries. Achieng(2010) claimed that trade openness promotes the efficient comparative advantage which allows the dissemination of knowledge and technological progress and encourages competition in the international business so .

Rate of inflation (INFL): The rate of inflation is act as a proxy variable for the quality of economic management. A high rate of inflation is a symptom for economic tension and of the inability of the government to maintain balanced budget and/or restrict money supply. The higher the inflation rate, the economy would be more at risk. And this variable is expected to affect economic growth negatively(Elbadawi et al, 1999).

4. RESULTS AND DISCUSSION

Unit Root Testing

In time series studies, proving for stationarity is a prerequisite to avoid spurious regression in the model and thus, we need to check whether the variables are not integrated of order two or more. If there is a unit root, it implies that the time series under investigation is non-stationary while the absence of a unit root shows that the stochastic process is stationary. In the ARDL model, the presence of I(2) variables are no more valid because they are based on the assumption that the variables are I(0) or I(1). In the ARDL procedure, the standard Augmented Dicky-Fuller (ADF) and Philips-Perron unit root (PP) tests were applied to check the order of integration of the variables. If any one of them found to be integrated of order two or more it is impossible to apply bound testing approach to co-integration test. The table-1 and 2 shows the result of ADF test and PP test for each variable respectively.

Table-1 : The Augmented Dickey-Fuller (ADF) unit root test result

Variables	ADF t statistics in level			ADF t statistics in first difference	
	With intercept	With intercept and trend	None	Intercept	With intercept and trend
GDPGR	-1.976645	-5.180265***	-0.502982	-9.116125***	-8.936896***
PEDSGD	-1.150542	-2.178307	-0.733330	-4.839764***	-4.844050***
DSSGD	-2.113953	-2.316328	-0.900282	-4.149604**	-4.114533***
DSSEXP	-3.486318	-0.585715	-2.444510	-1.508986***	-5.938340***
TRD	-1.280680	-1.365004	-0.40975	-5.447762***	-3.567961***
NEXGD	0.812959	-1.947114	1.842998	-7.015958***	-3.607344***
INFL	-5.480223***	-2.474913	-0.986772	-5.956370***	-5.850610***
MacKinnon (1996) Critical Values					
The critical values	With intercept	With intercept & trend	None		
1%	-3.646342	-4.243644	-2.636901		
5%	-2.954021	-3.544284	-1.951332		
10%	-2.615817	-3.204699	-1.610747		

Source: Author's own computation,2020

Note: *** and ** indicate the rejection of a null hypothesis of non-stationary at 1% and 5% level of significance, respectively. The lag length was determined by using Akaike information criterion (AIC).

In the rejection of the null hypothesis decision rule for rejection is based on ADF critical values. The decision rule is reject the null hypothesis if the ADF test statistics is less than the critical value, if this is the case the time series variables are stationary or has no unit root conversely, the accept null hypothesis if the ADF test statistics is greater than the critical values which shows the non-stationarity of the time series variables.

From the result of table-1 ADF test, the two variables GDPGR and INFL were stationary at level or without differencing at level of significance 5%. The remaining variables PEDSGD, DSSGD, DSSEXP, TRD and NEXGD were stationary at first deference with intercept and/or intercept and trend. This shows that the model incorporates both I (0) and I (1) variables and there is no variable integrated at second order,I(2). The result of the ADF unit root test is the rationale for applying the ARDL approach (bounds test approach of co-integration) developed by Pesaran, Shin, and Smith (2001).

Table-2: Philps- Perron(PP) Test for Unit Root Result

Variables	PP test statistics in level			PP test statistics in first difference	
	With intercept	With intercept and trend	None	Intercept	With intercept and trend
GDPGR	-4.229893***	-5.180265***	-2.230148	-8.637251***	-8.606345***
PEDSGD	-1.150542	-4.243644***	-0.778861	-4.797483***	-4.774457***
DSSGD	-1.479605	-1.671618	-0.680790	-4.066742**	-4.018734***
DSSEXP	-2.231791	-2.748372	-1.626647	-8.260670***	-8.171541***
TRD	-1.318952	-1.365004	-0.032581	-5.433082***	-5.374831***
NEXGD	-0.531607	-2.723886	1.262616	-7.372409***	-8.523858***
INFL	-5.489094***	-5.663888***	-4.176091	-24.37810***	-23.88073***

Source: Author's own computation,2020

Note: *** and ** indicate the rejection of a null hypothesis of non-stationary at 1% and 5% level of significance, respectively. The lag length was determined by using Akaike information criterion (AIC).

Like the ADF test, the PP test for unit root also verified that all the variables that were incorporated in the model become stationary after they are first differenced except the variables, GDPGR and INFL. Therefore, now the researcher confirmed that it is possible to use ARDL model in order to check the presence of long-run relationship among the variables

Model Diagnostic Tests

Selecting optimal lag length of each variable in the model is crucial. In line with this, Pesaran and shine (1999) explained that for small sample annual data, a maximum of two lag length is recommended for the variables. For the purpose, AIC (Akaik Information Criteria) was employed. Accordingly, a maximum lag length of 2 was selected for the conditional ARDL model in this study. The AIC selected the optimal lag length of each variable in the model(GDPGR, PEDSGD, DSSGD, DSSEXP, TRD, NEXGD & INFL) as ARDL (2, 0, 0, 1, 0, 2, 0).This determination of the lag length enables us to get the valid result and proper inferences in the model(See Annex-1).

In this study, various diagnostic tests were conducted for trustworthiness and verification of the estimated long-run and short-run models. The tests include serial correlation (Brush and Godfray LM test), Functional form (Ramsey's RESET test), Normality (Jaque-Bera test), Hetroscedasticity (Breusch-Pagan-Godfrey test) and also CUMSUM recursive residuals and CUMSUM square recursive residuals tests were applied to check the overall stability of the long-run and short-run coefficients as recommended by Pesaran et al.(2001).

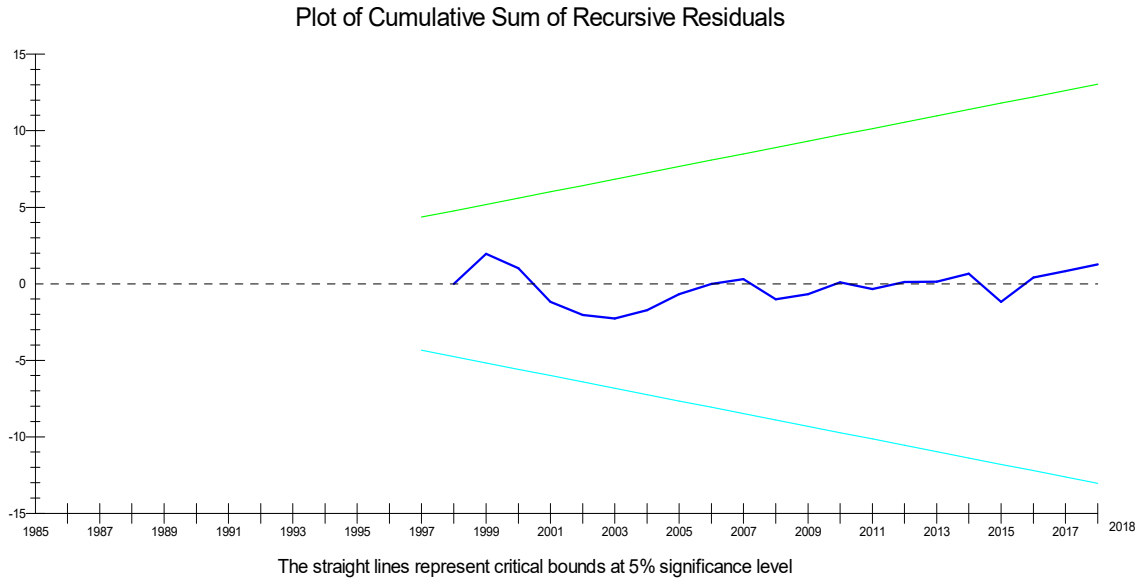
Table -3: Diagnostic tests of the model

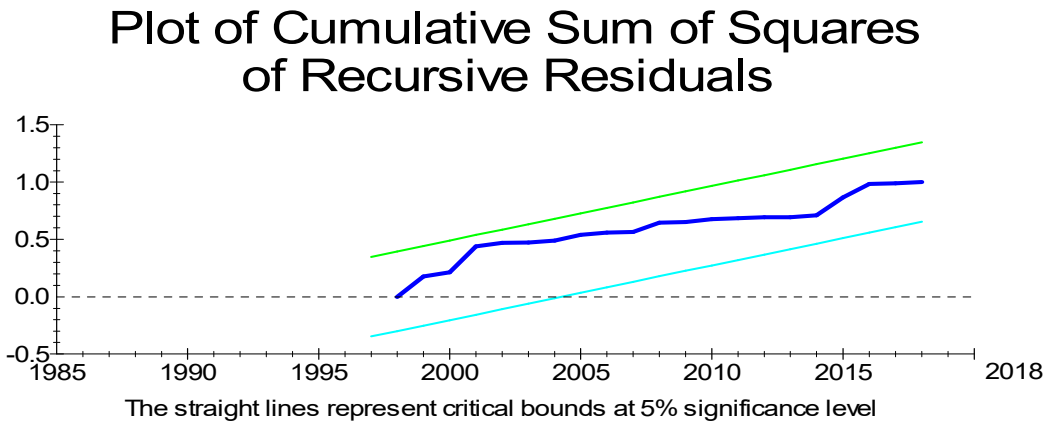
Test statistics	LM Version	F Version
A:Serial Correlation	CHSQ(1)= 1.9409[.164]	F(1, 21)= 1.2714[.272]
B:FunctionalForm	CHSQ(1)= 1.3964[.237]	F(1, 21)= .89945[.354]
C: Normality	CHSQ(2)= 4.0282[.133]	Not applicable
D:Heteroscedasticity	CHSQ(1)= 1.6385[.201]	F(1, 32)= 1.6202[.212]
A: This is Lagrange multiplier test of residual serial correlation B: It is Ramsey's RESET test result using the square of the fitted values C: It is based on a test of skewness and kurtosis of residuals in the model D: This is based on the regression of squared residuals on squared fitted values		

Source: Author's own computation,2020

From table-3, we can see that both the LM version and the F-version of the statistics are not sufficient to reject the null hypothesis specified for each test. The test confirms that there is no serial correlation problem. The null hypothesis of no serial correlation (Brush - Godfray LM test) is failed to be rejected due to that the p- value associated with the test static is greater than the standard significance level [0.164>0.05]. This LM test for serial correlation is applied since; it resolves the drawback associated with the traditional Durbin Watson test static that is not applicable when the lagged value of the dependent variable is incorporated as a repressor in the model. The Ramsey RESET test which tests whether the model suffers from omitted variable bias. We failed to reject the null hypothesis of Ramsey RESET test which says that the model is correctly specified. This is because the probability value is larger than the conventional significance value[0.237>0.05]. The result proves that the model did not have any omitted variable bias that the model is well specified. The other test conducted in the study is hetroscedasticity. The result of the study revealed that the errors are normally distributed and the model doesn't suffer from hetroscedasticity problem. The hetroscedasticity test and as we can understand from the result, the null hypothesis of no hetroscedasticity is failed to be rejected at 5% significant level due to its p-value associated is greater than the standard significance level [0.201> 0.05]. The normality test of Jaque-Berra the study failed to reject the null hypothesis that the residuals are normally distributed due to that the p value associated with the test is larger than the conventional significance value of 0.05[0.133>0.05]. Lastly, the stability of the model for the long run and short run relationships has been detected using CUMSUM and CUMSUM SQUARE test as suggested by Pesaran and shin (1997). In the test, if the cumulative sum remains inside between the two critical lines the null hypothesis of correct specification of the model can be accepted but if the cum sum goes outside between the two critical bounds there exists series parameter instability problem. In this study, both the CUMSUM and CUMSUM SQUARE of the residuals are found within the boundaries of the 5% significance critical bounds and it has been reached on conclusion that there is no structural instability in the model. Thus, the model appears to be so healthy, stable and efficient in estimating short run and long run relationship between the dependent variable and the included regressors.

Figure-1 Model Stability test





Source: Author's own computation,2020

Test for Long Run Relationship

In the process of applying the bounds test approach of co-integration, first estimating the ARDL model specified is mandatory. Then the value of F-statistics is found through the Wald-test conducted by imposing restrictions on the estimated long-run coefficients of variables. Formerly, the computed F-statistic value is compared with the lower bound and upper bound critical values. Then, the F-statistic value is associated with the lower bound and upper bound critical values tabulated in tables of Pesaran, Shin, and Smith (2001) and Narayan (2005). Subsequently, the lower and upper bound values of Narayan (2005) was found appropriate for small sample sizes between 30 and 80 observations ; consequently used in this study.

Table-4: F-Statistic for Bound Testing the Existence of Long-Run Relationship

Optimal Order of lag in the model	Calculated F-statistics	Number of observations
2	11.22440	35

Source: Author's own computation,2020

In table-4, the calculated F-statistics is 11.22440 and this value is greater than the upper bound critical values at both 1% and 5% level of significance(see Annex-2). The results indicate that there is strong evidence of long-run relationship or co-integration between real GDPGR and the remaining debt and variables in the model. The null hypothesis of no co-integration between the dependent variable real GDPGR and the independent variables has been rejected.

The Long Run coefficients of ARDL Model

Once the co-integration test in the model has been determined, long run coefficients are estimated in the model. In the scenario of the existence of long-run co-integration among the model variables we are allowed to analyze the dynamic long run coefficient of the model. The estimated long-run coefficients of ARDL (2, 0, 0, 1, 0, 2, 0) was the selected model based on AIC(see table-5).

Table-5 Estimation of the Long Run coefficients of ARDL Model

Dependent variable: GDPGR			
Independent variables	Coefficient	St.Error	T-Ratio[Prob]
PEDSGD	-0.142382***	0.065230	-2.182758[.0039]
DSSGD	-0.091582***	0.025369	-3.6101[.002]
DSSEXP	-0.2832E-3	0.012346	-0.022936[.982]
TRD	-0.029308***	0.0080284	-3.6505[.001]
NEXGD	10.0612*	5.5777	1.8038[.085]
INFL	0.022163	0.031684	0.69952[.492]
C	1.1599	2.4999	0.46399[.647]

Source: Author's own computation,2020

Note: ***, **,* denotes significance at 1%, 5%, 10% respectively (indicate rejection of the null 1%, 5%, 10% respectively)

From the ARDL regression results in table-5, the debt variable PEDSGD negatively affected GDPGR and significant at 1% level of significance in the long-run; and a 1 percent increase in the stock of public external debt, holding other things constant, leads to a 0.142 percentage decline in GDP growth. This might be due to use of public external borrowings on non-productive activities and inefficient utilization. The negative sign of the variable shows the evidence for the classical view on debt that public borrowings have a negative effect on a country's economy. This result confirms also the fact that high public external debt levels are associated with low growth as a higher tax burden on capital is required to service this stock of public external debt. This leads to a lower rate of return on capital and hence lower investment, dead weight loss and lower economic growth indeed. The result confirms the existence of the debt overhang problem is realistic in Ethiopia and it is consistent with theory of Krugman (1989) that claims an increase in accumulated debt stock results in higher tax on future output and impedes growth. Furthermore, this result is consistent with the studies by and Akram (2010) Babu et al. (2015), Bernardin, et.al (2018) and Udoh et al.(2020). The other debt variable is DSSGD and it has also a significant negative effect on economic growth. Given other factors constant, a 1% increase in DSSGD results in fall of economic growth by 0.092(see table-5).This result also highly confirms that there is the existence of debt overhang in the long-run in Ethiopia that makes the country one of highly indebted countries in Africa. It witnesses that huge amount of public external debt imposes higher tax burden that the economy needs higher amount of capital to service this stock of debt. This leads to the huge flight of capital from the economy which in turn in lower investment, and hampered economic growth. This finding is inline with Karagol(2002).

The variable, DSSEXP has negative effect but appears to have an insignificant impact on economic growth rate in the long run in Ethiopia. That is, the coefficient of public external debt servicing is insignificant in explaining GDP growth. It indicates that there is no evidence of crowding out effect of public external debt in Ethiopia unlike the debt overhang hypothesis. The study reveals that that a smaller proportion of the scarce resources transferred to foreign public debt payment never affects spending for development and hence economic growth in Ethiopia. The result is consistent with Akram,(2010) for Pakistan; but inconsistent with a study conducted by Shah and Pervin (2012).

The other variable in the model with a negative significant impact on economic growth was TRD. Given other factors constant, if there is a 1% increase in openness, it causes a decline in growth in RGDP by 0.029; and this recommends that openness can be pain for an economy and claim protectionism policy. The study result supports the argument that developing countries will not benefit from openness due to that they are often deficient of complementary inputs, quality institutions, and human capital. It is evidence for the failure of trade reforms to promote trade and growth in African countries(Ndkumana and Balimoune, 2007). Moreover, NEXPGD variable has a significant positive impact at 10% level of significance in Ethiopia. A 1% increase in national expenditure causes a growth of real GDP by 10.06. This advocates that domestic resources significantly boost economic growth. Economic growth boosts as more resources are effectively committed to the economy, and this confirms the Keynesian theory. INFL is the other variable in the model and it was found insignificant but has positive impact on economic growth

The Short-run Coefficient of ARDL-Error Correction Model (ECM)

The next step after the estimation of the long-run coefficients is the estimation of short-run coefficients using the error correction model. The coefficient of the error correction term shows the speed of adjustment to restore equilibrium in the model. It has expected negative sign and statistically significant showing that the variables converge to the long-run equilibrium. The existence of a stable long-run relationship among the variables is further confirmed by the significant error correction term (Akram, 2010).

Table-6: Error Correction for the Selected ARDL (2, 0, 0, 1, 0, 2, and 0) Model

Dependent variable = dGDPGR			
Independent variables	Coefficient	St.Error	T-Ratio[Prob]
dPEDSGD	-0.017827***	0.026239	-1.67943[.0050]
dDSSGD	-0.15040***	0.045624	-3.2965[.003]
dDSSEXP	-0.045014**	0.020789	-2.1653[.041]
dTRD	0.048130***	0.014989	3.2110[.004]
dNEXGD	-9.3906	15.7552	-0.59603[.557]
dINFL	0.036397	0.050952	0.71435[.482]
dC	1.9048	4.0759	0.46734[.644]
ECT(-1)	-0.60961***	0.16985	-9.6689[.000]
R-Squared 0.85465 R-Bar-Squared 0.78198 F-stat. F(9,24) 14.3734(0.000) DW-statistic 2.3330			

Source: Author's own computation,2020

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

The result in table-6 confirmed that the dependent variable was well explained by the variables included in the model. The adjusted R-Bar-Squared tells that about 78% of the short-run variation in the dependent variable(real GDP) is accounted by the explanatory variables in the model.

The model's capability has been tested by the F-statistic. Accordingly, the p-value (0.000) of the F-statistic indicated that the overall model was significant and explains the relationship. Moreover, the Durbin-Watson test statistic (2.3330) showed that there is no serious autocorrelation in the model. As can be seen from table-7, the coefficient of lagged error correction term, ETC(-1) is negative(-0.6096) and is significant at 1% level of significance. This implies the rejection of the null hypothesis of no co-integration. This shows the speed of adjustment from short-run disequilibrium towards long-run equilibrium. The study revealed that a speed of adjustment to equilibrium after a shock is high implied by the equilibrium error correction coefficient (ECT) which suggests that 61.96% of the error is corrected annually This shows that it takes about 1 year and 6 months to bring the economy back to equilibrium. Any deviation from long run equilibrium level of GDPGR in current period is corrected by 60.96% in the next period to bring back to equilibrium when there is a shock to a steady state relationship. The negative and such highly significant coefficient error correction term, ECT (-1) is a proof for the existence of a stable long-run equilibrium co-integrated relationship among the dependent variable and explanatory variables in the model.

From the short-run error correction model, the variable DDSEXP is negatively related with economic growth and is significant unlike in the long run that the variable does not appear to have significant effect on the economic growth. Here, a 1% increase in DSSEXP results in decline of economic growth(GDPGR) by about 0.045.This result is an evidence for Ethiopian economy to experience crowding out effect of public external debt in the short run . The result is consistent with Cholifihani (2008) and Shah and Pervin (2012) . But, the finding is inconsistent Akram,(2010).

Besides, the variables TRD, PEDSGD and DSSGD were also statistically significant in the short run like the long run estimates. The increase by 1% of TRD, PEDSGD and DSSGD each results in the decline of economic growth by about 0.048, 0.018, and 0.151 respectively. However, the variable NEXPGD was insignificant in the short run. The study also indicated that both in short-run and long-run the variable, INFL in the economy does have positive impact on economic growth but remains insignificant.

5. Conclusion and Recommendations

Conclusion

There is huge imbalance between the public spending and revenue in developing nations such as Ethiopia. To finance their budget deficit the governments mobilize additional source of finance from abroad; among these sources, Public external debt from lender countries and institutions takes a lion share. The challenge is that when a country relies heavily on public external debt as a source of finance it may lead to funds diversion to debt servicing at the cost of economic growth and domestic consumption. This heavy reliance on public external debt results in a debt burden problem reflected by an increasing stock of external debt and debt servicing.

This study was conducted to determine both short-run and long-run impact of public external debt on economic growth in Ethiopia with a time series data of 1983-2018. Over the study period, it was confirmed that economic growth is lower than public external debt to GDP ratio. The study adopted the ARDL bound testing approach developed by Pesaran and Shin (1995, 1999) to estimate the long-run dynamics. The short-run dynamics was analyzed with Error Correction Model(ECM). The public external debt variables incorporated in the model were PEDSGD as proxy for debt burden, DSSGD as proxy for the debt overhang and DSSEXP as an indicator of debt crowding out effect. Also, other macroeconomic variables such as inflation INFL,TRD and NEXGD were included in the study. The stationarity test checked using ADF test and Philip Peron test confirmed that that the

two variables GDPGR and INFL were stationary at level or without differencing at 5% level of significance. The remaining variables PEDSGD, DSSGD, DSSEXP, TRD and NEXGD were stationary at first deference. The bounding test revealed the presence of long-run relationship among the variables in the model. The study proved the existence of a stable long-run equilibrium co-integration between the dependent and the explanatory variables. The study revealed that a speed of adjustment to equilibrium after a shock is very high implied by the equilibrium error correction coefficient (ECT) in the short-run dynamics which is indicated by (-0.6096).

The results of the study showed that the variable, PEDSGD is significantly and negatively affects real GDP growth in the long-run and short-run. This is an evidence for the presence of classical view of debt overhang problem. The other debt burden indicator in the study, DSSGD has a significant negative impact on economic growth also both in short-run and long-run in Ethiopia and confirmed that the debt overhang hypothesis holds true in the country. The DSSEXP variable has negative impact but insignificantly affects economic growth in the long-run in the country. It is rationale to infer from the result that there is no crowding out effect of public external debt in the long-run. However, the short run result confirmed that the variable is significant and has a negative impact and there was evidence of crowding out effect problem of public external debt. Trade openness (TRD) does have negative and positive significant impact on economic growth in the long-run and short-run respectively. This negative effect of TRD on economic growth in the long-run is perhaps due to the excess of import over export in the country. But variable NEXPGD has a significant positive impact on growth of real GDP in the long-run. It implies that as more resources are committed to the economy, the more is their effectiveness in achieving higher rate of economic growth. This advocates that domestic resources significantly boost growth. But NEXPGD has negative impact on growth but insignificant in the short run.

Recommendations

Based on the results of this study the following recommendations have been forwarded:

- The study confirmed that there is significant negative impact of public external debt on economic growth. This hurts economy adversely so that government should take its part by mobilizing the domestic resources to cover the domestic expenditure through fiscal policy instruments such as tax mobilization. On the other hand, government should revise the policy related to debt management which helps to allocate the debt on productive activities and sectors and overcome mismanagement and inefficient utilization of the resources. In line with this, investment on efficient and productive capital should be encouraged.
- The study result confirmed that trade openness negatively affects economic growth in the long-run which witnesses the imbalance between imports and exports. In this regard, government should make reform for modernizing the export sector and strengthening the import substitution strategy which both in turn helps the country to accumulate the foreign currency to service the public external debt. Besides, the government should make strong intervention to establish working institutional set up of for improving the external sector of the economy to maintain the discipline and balance of the macro economy.
- The Ethiopian government should give emphasis to foreign direct investment to reduce the foreign exchange gap and the higher amount public external debt and the danger of suffering from debt burden.
- Government should reduce its budget deficit by mobilizing resources from different alternative revenue sources such as fair and equitable tax.
- Appropriate exchange rate policy such as Ethiopian Birr devaluation and trade policy and tools such as tariffs should be revised in effort t minimize the public external debt burden and as policies that enhance the exports of country and reduce imports of luxuries items.
- The private-government partnership in the part of appealing in developmental projects for provision of infrastructural facilities which currently government takes a lion share and is solely on its shoulder. This kind of partnership reduces the government's huge burden of providing the infrastructures for facilitating development so as external debt. This in turn creates a supporting environment for the home grown industries and correspondingly appeals foreign investors into the country which has the positive effect of economic growth.
- Given the huge savings gaps in Ethiopia, the government should ensure that the public external loans are invested in feasible and efficient development projects that would eventually generate sufficient returns for amortizing the external debt.

REFERENCES

Achieng, B. J. (2010). Domestic debt and private investment in Kenya. University of Nairobi.

African Development Bank(2010). Ethiopia's Economic Growth Performance: Current Situation and Challenges, Africa Development Bank Group, Economic Brief, Vol.1, No. 5

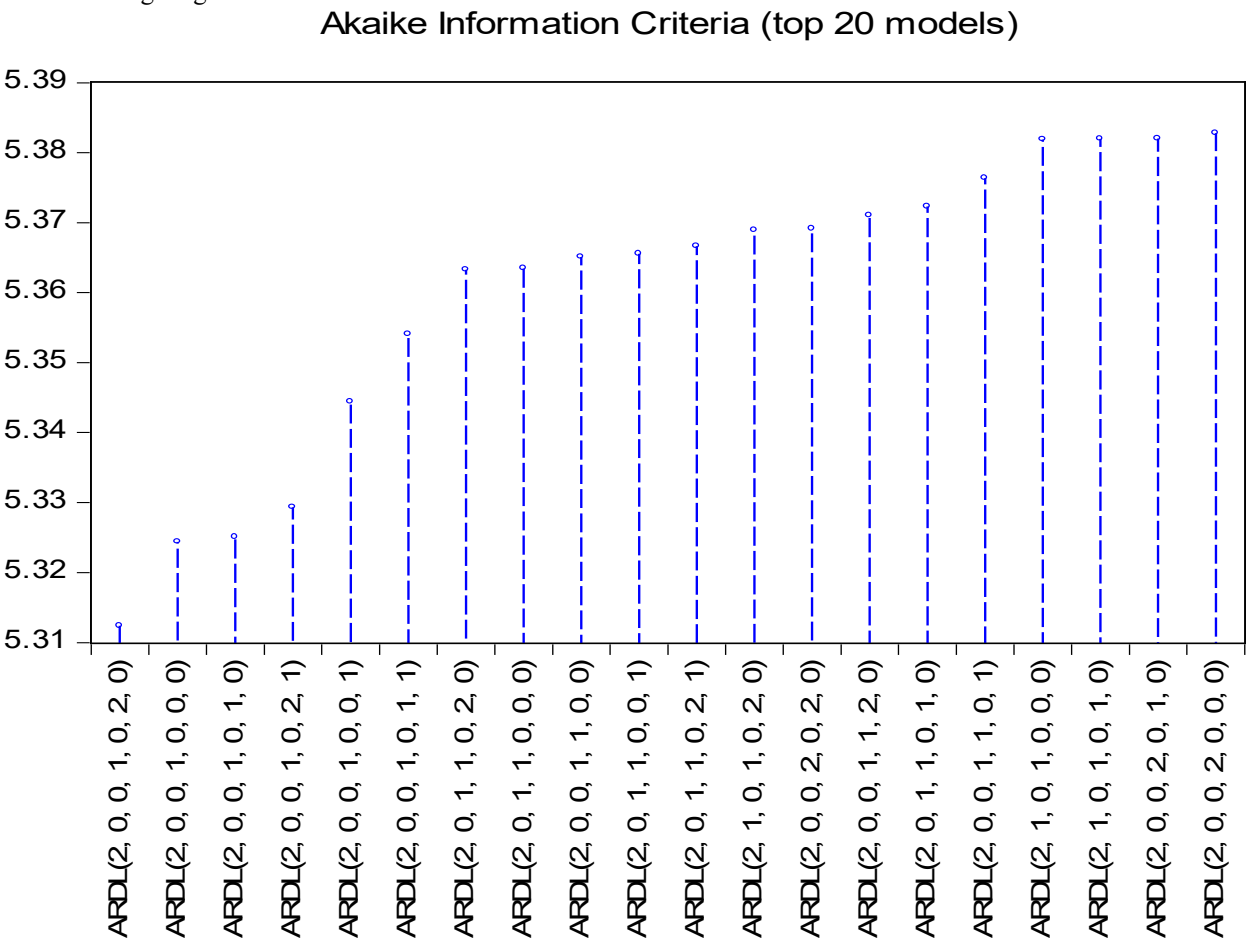
Ajayi, S.I. and M.Khan (2000). External Debt and Capital Flight in Sub-Saharan Africa, International Monetary

Fund, Washington DC.
Akram, N. (2010). Impact of public debt on economic growth in Pakistan. *The Pakistan Development Review, 50*(4), 599-615.
Alemayehu, G. and Daniel, Z. (1998). Profile of Ethiopia's External Debt", Paper prepared for the 8th Annual Conference on the Ethiopian Economy.
Al-Zeaud, H.A.(2014). Public debt & economic growth: An empirical assessment. European
Ayadi, F. S, & Ayadi, F. O. (2008). The impact of external debt on economic growth: A comparative study of Nigeria and South Africa. *Journal of Sustainable Development in Africa*, 234-264.
Babu, J. O., Kiprop, S., Kalio, A. M., and Gisore, M. (2015). Effect of domestic debt on economic growth in the east African community. *American Journal of Research Communication*, 3(9) :73-95.
Bakare, A.S. (2011). The Macroeconomic Impact of Foreign Aid in Sub-Saharan Africa: The Case of Nigeria. Business and Management Review Vol. 1(5)
Befekadu, D. (1992). Growth and Foreign Debt: The Ethiopian experience: 1964-86, *AERC Research paper 13,* Nairobi.
Bernardin S., Agbemavor, K. and Peter Q.(2018).The Effect of External Debt on Economic Growth in Sub-Saharan Africa. International Journal of Business and Economic Sciences Applied Research(IJBESAR), ISSN 2408-0101, Eastern Macedonia and Thrace Institute of Technology, Kavala, Vol. 11, Iss. 1, pp. 61-69.
Chenery, H.B.; and Strout, A. (1966). Foreign Assistance and Economic Development. American Economic Review. Vol. 56.
Cholifihani, M.(2008). A Co-integration Analysis of Public Debt Service and GDP in Indonesia. *Journal of Management and Social Sciences, Vol. 4, No. 2, 68-81.*
Chongo, B. M. (2013). An Econometric Analysis Of The Impact Of Public Debt On Economic Growth : The Case Of Zambia.
Clements, B., Bhattacharya, R., & Nguyen, T. Q. (2005). External Debt, Public Investment, and Growth in Low-Income Countries, IMF Working Paper No. 03/249.
Dickey, D. A., & Fuller, W. A. (1986). Likelihood Ratio Statistics For Autoregressive Time Series With A Unit.Econometrica (pre-1986);Jul 1981;pp. 49, 4;
Elbadawi, Ibrahim A.; Ndulu, Benno J.; Ndungu, Njuguna (1999).Debt Overhang and Economic Growth in Sub-Saharan Africa. External Finance for Low-Income Countries. (Eds.) Iqbal, Zubair, and Ravi Kanbur. Washington D.C. IMF Institute.
Engle, R. and C. Granger (1987). Co-Integration and Error Correction: Representation, Estimation, and Testing. Econometrica, Vol.55, No., 2: 251-276.
Ezeabasili, V N. Isu, H O. and Mojekwu, J N. (2011).Nigeria's External Debt and Economic Growth: An Error Correction Approach, International Journal of Business and Management Vol. 6, No. 5.
Gebrekidan A. Alemu G. Yoseph G. (2013). The impact of external debt on Economic growth of Ethiopia, Ethiopian Economic Association, ISBN/ISSN: 978-9994-54-03-7
Gohar, M., and Butt, F. (2012). The Impact of External Debt Servicing on the growth of Low Income Countries, Sukkur Institute of Business Administration. *In Proceedings of 2nd International Conference on Business Management (ISBN: 978-969-9368-06-6)*
Gujarati. (2004). Basic econometrics, McGraw-Hill Companies, 4th edition.
Johansen, S. and K. Juselius (1990), "Maximum Likelihood Estimation and Inference of Co-integration: with Applications to the Demand for Money." Oxford Bulletin of Economics and Statistics 52:169-210.
Karagol E. (2002). The Causality Analysis of External Debt Service and GNP: The Case of Turkey. Central Bank Review, Vol. 2, No. 1, PP. 39-64.
Kassu M., Mishra D.K. and Asfaw. (2014). Public External Debt, Capital formation and Economic growth in Ethiopia, Journal of Economics and Sustainable Development, ISSN 2222-1700 (Paper) ISSN 2222-2855 (Online), Vol.5, No.15 2014
Kibrom, G. (2013).Determinants of Private Domestic Saving in Ethiopia:ARDL to Co-integration Approach.
Krugman P.(1989). Financing versus Forgiving a debt overhang. Working paper no. 2486. National bureau of economic research, 1050 Massachusetts avenue, Cambridge University
MacKinnon,J. (1996). Numerical Distribution Functions for Unit Root and Co-integration Tests," Journal of Applied Econometrics, 11, 601-618.
Mahmud Hasan Shah and Shahida Pervin(2012). External Public Debt and Economic Growth: Empirical Evidence from Bangladesh. Academic Research International. ISSN: 2223-9944 Vol. 3, No. 2, September 2012
Mbah, S. A., Agu O. C. and Umunna G(2016). Impact of External Debt on Economic Growth in Nigeria: An ARDL Bound Testing Approach. *Journal of Economics and Sustainable Development.* Vol.7, No.10 (2016).
Mulugeta F. (2014). The Impact of External Debt on Economic Growth in Ethiopia *MSc thesis* Addis Ababa University.
Nantwi, O. and Erickson,C. (2016). Public Debt and Economic Growth in Ghana. African Development Review,

Vol. 28, No. 1, 2016, 116–126, April 2017.
Narayan, P. (2005). The saving and Investment Nexus for China: Evidence from Co-integration Tests", Applied Economics, 37: pp1979-1990.
National Bank of Ethiopia (NBE) (2018). Annual Report 2018. Addis Ababa, Ethiopia.
Ndkumana, L. and Baliamoune-L., M. (2007).The Growth Effects of Openness to Trade and the Role of Institutions: New Evidence from African Countries. Economics Department Working Paper Series. Paper series 05.
Obudah, B.C. and Tombofa, S.S. (2013). Effects of Interest Rate and Debt on Equity Investmen. American Journal of Humanities and Social S. Vol. 1.
Okonjo- Iweala, N., Soludo, C, and Muthar, M., (2003). The Debt Trap in Nigeria: Towards a Sustainable Debt Strategy, Trenton NJ: Africa World press Inc.
Onakoya,A. and Ogunade,A.(2017). External Debt and Nigerian Economic Growth Connection: Evidence from Autoregressive Distributed Lag Approach. Journal of Economics and Development Studies, Vol. 5, No. 1, pp. 66-78, March 2017,
Pesaran, H. and Y. Shin (1999).An Autoregressive Distributed Lag Modeling Approach to Co-integration Analysis", Cambridge, UK
Pesaran, H. M. and Shin,Y. (1995). Autoregressive Distributed Lag Modelling Approach to Co-integration Analysis. DAE Working Paper Series No. 9514 (Cambridge: Department of Applied Economics, University of Cambridge).
Pesaran, H., Shin,Y.,and R. Smith (2001). Bounds Testing Approaches to the Analysis of Level Relationships. Journal of Applied Econometrics, 16(3):1924-1996.
Pesaran, M. H, Shin, Y, & Smith, R. J. (1996). Testing for the 'Existence of a Long run Relationship (No. 9622). *Faculty of Economics, University of Cambridge*.
Phillips, P.C.B. and P. Perron (1988). Testing for Unit Roots in Time Series Regression, Biometrika, 75, 335-346.
Ramakrishna (2002). External Debt of Ethiopia: An Empirical Analysis of Debt and Growth. Journal of Business and Public Affairs.
Safia Shabbir (2013). Does External Debt Affect Economic Growth? Evidence from Developing Countrie's, SBP Working Paper Series No. 63, State Bank of Pakistan.
Sami A. and Mbah S.(2018).External Debt and Economic Growth: The Case of Emerging Economy. Journal of Economic Integration, Vol.33 No.1, March 2018
Soludo, C. (2003). Debt, Poverty and Inequality: Towards an exit strategy for Nigeria and Africa, *CBN Economic and Financial Review, 24* (4),
Teshome. A (2015). Development Finance and Debt Sustainability in Ethiopia: Lesson to Sub-Saharan African Countries.
Tsadkan A. (2013). The nexus between public spending and economic growth in Ethiopia, Addis Ababa University
Udoh, E. and U. Ogbuag (2012).Financial Sector Development and Industrial Production in Nigeria, An ARDL Co-integration Approach .Journal of Applied Finance & Banking, Volume 2 (4): P49-68.
Udoh,B.,Ekeowa,L.,Okechukwu,S.,Afamefuna,O.,Cordelia5N.(2020). Effect Of Intergenerational Debt Burden On Economic Growth In Nigeria. Humanities and Social Sciences Letters . ISSN(e): 2312-4318 , Vol. 8, No. 2, pp. 133-144.
Umaru, A. Hamidu, A., and Musa, S., (2013). External debt and Domestic Impact on the Growth of the Nigerian Economy. International Journal of Educational Research.
Were, M. (2001), The Impact of External Debt on Economic Growth in Kenya, Discussion Paper 2001/116, United Nations University/World Institute for Development Economics Research.
World Bank (2015). World Development Indicators (WDI), Washington, DC: *World Bank*

Annex

Annex-1: Lag length of variables in the model



Source: Author's own computation,2020

Annex-2: The critical values for bound test for the cases with unrestricted intercept and trend

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

Source: Pesaran et al. (2001) and Narayan (2005)