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External Debt-Economic Growth Nexus in Developing Countries: Evidence from Ethiopia

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Abstract
This paper aims to explore the role of external debt (both stock and service) on economic growth in Ethiopia over a period of about 35 years starting from 1981/82 to 2015/16 using Johansen co-integration test and Vector Error Correction Model (VECM).Granger causality test is also performed to check the direction of the causation in the short run. The result of cointegration test using Johansen maximum likelihood approach reveals the existence of multiple long run equilibrium relationship between the debt variables and economic growth. The empirical result from the Growth equation shows that external debt stock has a significant and positive long run relation to economic growth as measured by the growth of real GDP while its square has significant and negative relation with the growth suggesting that there exists a none linear relationship and it has a positive contribution only up to some optimum level. External debt service on the other hand, has significant and negative relation to the long run growth of the country. The main conclusion of this paper is that the outflow of domestic capital which is needed to service external debt has negative impact on an economic growth both in the long run and short run. Whereas debt stock has a positive impact on economic growth in the long run if it is kept at its optimum level.
Keywords: Economic growth, Vector Error Correction Model (VECM), External debt, Cointegration, Granger causality

1. Introduction

External debt remains one of the sources of financing budget deficits in developing countries. Adepoju et al. (2007) noted that developing countries in Africa are characterized by inadequate internal capital formation due to the vicious circle of low productivity, low income, and low savings. Therefore, this situation forces LDCs to look for technical, managerial, and financial support from Western countries to bridge the resource gap created by the vicious circle. External borrowing is done not only to finance deficits but also to put the economy on the pedals of growth cycle. If debt is utilized efficiently in a well-directed manner then not only the economy comes out of crises but it also grows. In the developing nations, characterized by lack of basic infrastructure and capital, they need to have these resources necessarily in order to grow and these resources can be purchased by credit taken from developed nations and from the international market as well.

On the contrary to this, there are claims that external debt is acting as a major restraint to capital formation and hence to economic growth in under developed nations by crowding out private investment because as debt accumulates the servicing requirements and the principal repayment increases. In view of the above, external debt becomes a self-perpetuating mechanism of poverty aggravation and a constraint on development in developing economies (Folorunso S. Ayadi et al, 2008). There is growing concern whether the accumulated stock of external debt and its repayments by the Less Developed Countries (LDCs) act as a barrier to their economic growth and development as claimed by different intellectuals.

The historical debt crisis experienced by Sub-Saharan African countries which, as it has been argued by different scholars, resulted from a complex combination of elements, some of which are exogenous to the debtor countries, while others are direct results of wrong policies, is used as a bench mark for studying the impact of external debt on economic growth. Over the past two decades or so, economist and policy-makers have suggested alternative proposals and tried different remedies to reduce or solve the external debt problem of poor counties. One proposal was the rescheduling of non-concessional loans. However, it was realized later that inefficient government policies could hinder the beneficial effects of debt reform. This led to proposals of raising the level of foreign lending (at lower interest rates) to heavily indebted developing countries, contingent on domestic policy reforms such as reduced public sector deficits and export promotion. More recently, when countries accumulate loans and have difficulty in repayment, debt relief has been suggested (AmaniElnasri, 2006).

Making an acceptable and sustainable amount of debt can both be used as compensation for budget deficits and also helps avoid overdraft from banks that would otherwise cause the problems of currency issuance and inflation (YunheQiu, 2010).

Being one of the developing countries, Ethiopia's external debt was both unsustainable and volatile. In line with this, according to the World Bank classification of Highly Indebted poor countries, the country is one of the severely indebted low-income countries. Ethiopia's external debt has changed significantly in magnitude, structure and composition over the last quarter of the 20`th century. In 1975, it stood at about US$ 343.7 million, equivalent to 14% of the GDP, and US$ 9.1 billion (214% of GDP) in 1991. As of June 30, 1999 this figure had increased to an equivalent of US$ 10.2 billion. Even though as of 30 June 2005, following the debt relief granted in accordance

with development initiatives designed to benefit the Heavily Indebted Poor Countries (HIPCs), it had declined to USD 5.92 billion (MeleseGizaw, 2005), recently, the figure has further increased to USD 11.22 billion as of June 30, 2012 and further 21.74 at the end of 2016 (MoFEC, 2016); being four times bigger than its figure in 2005. Therefore, the question is how economic growth will be affected by the accumulated and rapidly increasing external debt stock and the repayment of debt

1.1 Statement of the problem

Do countries with high external debt accumulation grow faster/ slower? This simple question doesn't have a simple answer. The contribution of External debt on economic growth remains a debated issue by both academicians and policy makers. Currently, there have been attempts to answer the question of whether the rising external debt stock shows positive or negative contribution on the growth rate of an economy, but most of them end up with controversial conclusion and their findings are mixed at best. Significant number of researchers mentioned in their research work that there exists a negative relationship between external debt and economic growth; César Calderón et al (2013), António Afonso et al (2014), Cristina Checherita et al (2010), Vighneswara Swamy (2015), while other researchers such as Jernej Mencinger et al (2014), Markus Ahlborn et al (2016), P. Tsintzos1, T. Efthimiadis (2011), Alfredo Schclarek (2004), Tilemahos Efthimiadis (2011) came up with the finding that external debt stock has a neutral as well as positive impact on economic growth. No doubt, governments borrow to fill the fiscal gaps in the proposed expenditure and expected revenue within a fiscal period on one hand and to avoid unfavorable conditions in macroeconomic stability which would otherwise happen by printing more money to fill the fiscal gap. To achieve these opposing goals, then debt option becomes the only available avenue that the government can look for to provide social overheads for its citizen.

Governments borrow in principle to finance public goods that increase welfare and promote economic growth. The spending has to be financed either through taxation, through seigniorage or with debt. Theoretically, it is expected that the marginal product of capital should be higher than the world interest rate for developing countries. Then, such countries would benefit from external borrowing (Eaton, 1993). Therefore, the only guideline is that the rate of return on spending should exceed the marginal cost of borrowing on the assumption that debt is paid while explaining the deficit-debt-growth relationship posited that larger budget surpluses are associated with more rapid growth through greater capital accumulation and greater productivity growth. (Ogunmuyiwa, 2011). This version of explanation is largely adopted by most governments in developing country where there is no room for the problem of debt overhang and crowding out effect apart from most empirical findings.

However, many scholars argue that debt would only play a positive impact if it is stable. After the government debt exceeds a certain level, it will not remain a blessing to one's development. Excessive debt may depress the growth by limiting the productivity and weakening investment growth so developing countries are expected strive hard to achieve a sustainable economic growth. Therefore these governments need to gain control over their expending fiscal deficit. In contrast to that, if the government debt is not sustainable, it will put the economic prosperity into a risky situation. Since it should be remembered that the debt also hints at a higher current account deficit, which means the debt most certainly could just as well lead to an unbalanced debt in a country. The debt for any economy is either a public or a publically guaranteed debt; it involves the contingent liabilities which play an important role in the cultivation of the entire economy. Developing countries usually have limited internal sources to yield their revenue. If they fail to utilize their debt productively, mobilize investment and create new employment opportunities; they will eventually get stuck up with the lower revenue base which in turn will affect their spending capacity, thereby leading to higher debt service payment. The inability to service debt on time not only makes it harder for developing countries to get aid at concessional rates with less conditionalities from donor agencies, but it also increases the country's risk. (YunheQiu, 2010).

Ethiopia, as one of the developing nations, has been experiencing similar problems. According to the World Band classification of highly indebted economies, the country is one of the severely indebted low income countries. Ethiopia's external debt has changed significantly in magnitude structure and composition over the last three decades. In 1975, it was only USD 343.7 million, equivalent to 14% of the GDP and eventually, this figure raised to USD 9.1 billion, (214% of GDP) in 1991 (Hailemariam; 2010). As of June 30, 2006 this figure has decreased to USD 6 billion due to the implementation of HIPC and MDRI debt relief initiatives. In response to this two initiative the country's debt outstanding has shown significant but temporary reduction and fall down to USD 2.31billion in 2007 while the figure revised an upward shift reaching USD 11.22 billion in 2012/13 and further to USD 21.54 billion in 2015/16 (MoFEC; 2016). Debt service payment on the other hand has currently exhibiting an increasing trend, being USD 77.17 million in 2008/09, it has increased to USD 111.28 in 2009/10 and farther increased to USD 1,089 million in 2015/16.

On the contrary, the country's ability to repay its external obligation as measured in terms of its export earning, is not coping up with the increase in the debt burden even showing a significant decrease from 2012/13 to 2013/14 by 8.5 percent and further by 5 percent in 2015/16 (NBE, 2016)

Based on the joint World Bank-IMF debt sustainability framework, the last Debt Sustainability Analysis

(DSA), prepared in August 2016, concluded that Ethiopia was at a moderate risk of external debt distress. Despite the fact that Ethiopia reached the completion point under the Heavily Indebted Poor Country (HIPC) Initiative in 2004 and benefited from debt relief under the Multilateral Debt Relief Initiative (MDRI) in 2006, recently, public and publicly guaranteed (PPG) external debt rose rapidly and reached 30.2 percent of GDP at the end of 2015/16 being only 18 percent in 2012. The PPG external debt indicators such as present value of debt to export, present value of debt to GDP, present value of debt to revenue and debt service to export ratio are on average moving upward. PV of debt to export ratio is risen from 86.7% in 2009/10 and it breached the threshold level of 150 % in 2015/16 and the country's debt distress rating is being deteriorated from low risk in 2013/14 to moderate risk in 2015/16 (IMF, WB: 2016). In their annual report, WB and IMF tried to assess the impact of debt on Ethiopian economy. According to them, debt might have a positive impact in the long run due to the fact that most of them are allocated to finance infrastructures and related social overheads which are expected to yield high return in the long run. On the other hand, since the country is highly exposed to external risks and its repayment capacity, which can be measured in terms of its export earning, is remains at its lowest stage, the accumulated external debt might affect the economy negatively. But it is unclear whether the negative or positive effect outweighs.

Under increasing trend of debt service, there is high probability of "debt overhang" problem to arise; which would increase the amount of repayments by increasing the difference in the actual and contractual value of repayments, thus ultimately increasing the debt servicing burden of a country. P.Tsintzos et al, (2001) mentioned in their paper that when the situation of debt overhang arises i.e. when the expected repayment falls undersized of the contractual size of the repayment, then debt service increases as a share of country's output level which serves as strainer of fiscal resources of the country. This arises when the rising debt service in the face of rapidly growing debt stock reduces the availability of resources for initiating growth or it may entail in draining scarce foreign exchange which might otherwise be used for alternative investment needs.

Despite of the fact that, there have been attempts by previous researchers on the area in Ethiopia most of them have methodological limitations. Melese G. (2005) and Hana A. (2013) have conducted research on the same topic independently; trying to estimate the impact of external debt on Economic growth in Ethiopia, but both used a simple ordinary least square (OLS) estimation method which is not advisable on none stationary time series variables due to the problem associated with spurious regression. There are other studies on the same topic by Mulugeta F. (2014) and Abnet G (2005) using vector error correction model but the model specification lacks clarity that whether external debt stock affects economic growth uniformly at any level, i.e there is no way to determine if the size of debt accumulation matters. This study is expected to contribute to the existing knowledge in the area in different ways; first, in the best of the researcher's knowledge, recently there is no attempts made on the topic in Ethiopia so that this work is expected to fill the time gap. Second, the study tries to extend the existing knowledge by providing a timely updates by examining impact of both debt stock and service simultaneously on the economic growth, by extending the sample to the current time. Thirdly, this study tries to fill the methodological gaps of the previous research by adopting the right and most acquainted model as well as by making necessary adjustments on the model specifications, being of course, supported by alternative empirical works.

1.2 Research question

Based on the problem statement above, the following research questions are set

- What is the effect of external debt stock on economic growth in Ethiopia?
- What is the effect of external debt servicing on economic growth in Ethiopia?
- Does a long run relation exist between external debt and Economic growth in the country?
- Is there any significant causal relation acting up on economic growth from external debt?

1.3 Objectives of the Study

The general objective of the study is to examine the impact of external debt on economic growth in Ethiopia.

1.3.1 Specific objectives

In order to achieve this general objective, the study has the following specific objectives.

- Checking if there exist a long run relationship between Debt and Economic growth in Ethiopia
- Examining the impact of external debt outstanding on economic growth
- Examining the effect of external debt servicing on the economic growth
- Examining the short run dynamics between the two variables
- Empirically investigating the directions of the causation between external debt and economic growth in the country.

2. MODEL SPECIFICATION AND METHODOLOGY

2.1 Model specification

The growth model in this study is specified based on the theoretical as well as empirical justifications. Since the

objective of the study is to account the role of external debt to economic growth, the general economic growth model is augmented with debt variables. In addition to that, the fiscal and monetary policy responses to economic growth is taken in to account by introducing policy variables such as government fiscal balance as well as money supply (broad). To account the rest of the world's contribution, degree of openness is introduced. Output growth is determined by domestic savings, debt burden, physical and human capital, and other macroeconomic variables. The model adopted below is based on César Calderón J. Rodrigo Fuentes, (2013), which employs widely, used determinants of the economic growth such physical and human capital. The model also includes the indicators of debt burden like the face value of the stock of external debt as a share of GDP; the external debt service obligation of the country. In addition to that, the square of debt stock is included to test if there exists a nonlinear relationship between debt and growth

The reduced-form growth model is given as follows:

GDP_t=f(DS_t,$DSTCK_t$, $DSTCK(sqr)_t$, EDU_t,GCF_t,$OPENNES_t$,CPI_t, B_DEFCIT_t, MS_t) , …(2.1)

Where: GDP_t = real gross domestic product (GDP) at time t; DS = external Debt service; DSTOCK = External debt stock

DSTCK(sqr) =the square of external debt stock which is intended to measure the non-linearity of the external debt economic growth relation; EDU = total expenditure on education, which is used as a proxy for human capital; GCF = Gross capital formation used as a proxy for total saving/ investment which measures the physical capital accumulation; OPPENNESS = The degree of trade openness measured by the sum of export and import as the share of GDP which measures the degree of exposure of the economy to the external world; B_DFCIT is government budget deficit; MS = Money supply (broad money supply) which measures the monetary policy dynamics; CPI = consumer's price index which measure the price stability (level of inflation)

The variables involved in the above equation; eqn. (2.1) are expressed in terms of natural logarithm to be able to look at the relative contribution (elasticities) of each variable to the growth process. Therefore the above model is expressed as;

$$LGDPt = \beta_1 LDS_t + \beta_2 lDSTCK_t + \beta_3 lDSTCK(sqr)_t + \beta_4 lEDU_t + \beta_5 LGCF_t + \beta_6 LOPENESS_t + \beta_7 LCPI_t + \beta_8 LB\_DFCIT_t + \beta_9 LMS_t + u_t \quad \ldots\ldots(2.2)$$

Where: each variable in equation 2.1 is converted in to natural logarithm, the parameters, such as β_1, β_2... β_8 are coefficients of elasticities and u_t is the usual error term Which is assumed to be white noise. A Subscript (t), on the other hand, refers to time period on yearly basis.

2.2. Data source and description

Regarding data type, the study used secondary time series data for about 35 years obtained from internal and external sources. The selection of this sample size is made based on the availability of data for each of the variable included in the model for the entire time horizon while its sufficiency is taken into consideration as well. The major sources of data for the problem under investigation were Ministry of Finance and Economic Cooperation (MoFEC), publications of National Bank of Ethiopia (NBE), Central Statistics Authority (CSA) of Ethiopia, Ministry of Education and Ethiopian Revenue and customs authority (ERCA). In addition to these domestic sources, some variables for which there are no sufficient data from the domestic sources, are collected from external sources, especially from IMF and WB databases

In this paper, though, Variables are included, excluded, or proxied based on theoretical and/or empirical justification, however, data availability and measurability acted as major constraints in terms of which variables to include.

Given this constraint, gross capital formation is taken as proxies for the rates of growth of factor inputs (capital) in the production process, while expenditure on education as the percent of GDP is typically used as a proxy for the quality of human capital. Central government fiscal balance (budget deficit is included aiming to control for the impact of fiscal balances on growth. The openness indicator takes account of the impact of external economic performance on economic growth as substantial literature arguing that economies that are more open to trade enjoy higher long-term rates of growth of per capita real income (Sachs and Warner (1995)), and therefore the sum of import and export as the share of GDP is taken as a proxy for the degree of the openness of the economy. Debt service is included into the model aiming to test the empirical claims that the higher the debt service, the greater will be the flow of financial resources from the country causing domestic investment and hence, growth to decline. Other variables used in our models include the external debt stock. This variable is a traditional debt indicator that compares a country's debt stock with its productive capacities. By implication, the higher a country's debt stock is compared with its output, the greater the debt burden or indebtedness of that country.

This study used Johanson's cointegration test to check if there exist a long run relationship between growth variables and External debt variables. The Direction and the magnitude of the relation is estimated using Vector Error correction mechanism (VECM) between GDP and external debt in Ethiopia between 1980 and 2016. Other

econometric tests such as unit root test have been conducted to make sure that variables are stationary either at level or at their first difference.

2.3. Methodology

2.3.1. Stationary versus Non-stationary series

It is fairly accustomed knowledge that we sometimes obtain between quantities varying with the time (time-variables) quite high correlations to which we cannot attach any physical significance whatever; although under the ordinary test the correlation would be held to be certainly significant. As the occurrence of such non-sense correlations make one's mistrust the serious arguments that are sometimes put forward on the basis of correlations between time series. Such problem arises when empirical studies on time series falsely assumes that the underlying time series is stationary (while it was really non-stationary) so that in regressing those variables on another one, one could end up with getting a very high R^2, though, there is no meaning full relations among the variables. This kind of problem is widely termed as "spurious regression problem" where this problem could persist in nonstationary time series even if the sample is very large. If y_t and x_t, for example, are independent random walks and $\beta = 0$, there is no relationship between y_t and x_t, and is called a spurious regression. Granger and Newbold (1974) performed Monte Carlo experiments and showed that the usual t statistics from OLS regression provide spurious results: given a large enough dataset, we can almost always reject the null hypothesis of the test that $\beta = 0$ even though β is in fact zero. Here the OLS estimate does not converge to any well-defined population parameter. But Phillips (1986) later provided the asymptotic theory that explained the Granger and Newbold (1974) results. He showed that the random walks y_t and x_t are first-difference stationary processes and that the OLS estimator does not have its usual asymptotic properties when the variables are integrated of order one (I(1)). Due to the fact that y_t and x_t are covariance stationary having constant mean and variance as well as auto covariance dependent only on the lag length, a simple regression of y_t on x_t appears to be a viable alternative. However, if y_t and x_t cointegrate, as defined under 4.3.3, the simple regression of y_t on x_t is miss-specified.

Therefore, to avoid the drawback of wrong inferences from a non-stationary regression, the time series data should be stationary. Since the regression of non-stationary variable upon non-stationary variable might give a very attractive result, which might be characterized by high R^2 and a low Durbin-Watson (DW) statistics while in actual fact, they are spurious; the result obtained from such regressions will not have a meaningful economic interpretation. To avoid this drawback, prior to estimation, a formal test for stationarity has to be made. A test of stationarity that has become widely popular over the past several years is the unit root test.

2.3.2. The Unit Root test

Many economic and financial time series exhibit trending behavior or nonstationarity in the mean. Leading examples are the levels of macroeconomic aggregates like real GDP. An important econometric task is determining the most appropriate form of the trend in the data. The data must be transformed to stationary form prior to analysis. If the data are trending, then some form of trend removal is required. Two common trend removal or de-trending procedures are first di erencing and time-trend regression. First di erencing is appropriate for I(1) time series and time-trend regression is appropriate for trend stationary I(0) time series. Unit root tests can be used to determine if trending data should be first di erenced or regressed on deterministic functions of time to render the data stationary.

Although there are many ways of unit root tests, most of them are valid if the time series is well characterized by an AR(1) with white noise errors. For its popularity and consistency, augmented Dick-Fuller (ADF) test is chosen in this study. The ADF test tests the null hypothesis that a time series yt is I(1) against the alternative that it is I(0), assuming that the dynamics in the data have an ARMA structure. The ADF test is based on estimating the test regression:

$$Y_t = ?2'D_t + ?|Y_{t-1} + \sum_{j=1}^{p} \Psi_j \Delta Y_{t-j} + \varepsilon_t \qquad (2.3)$$

Where D_t is a vector of deterministic terms (constant, trend etc.). The p lagged difference terms, $\Delta yt-j$, are used to approximate the ARMA structure of the errors, and the value of p (where the maximum lag length p can be estimated empirically) is set so that the error ε_t is serially uncorrelated. The error term is also assumed to be homoscedastic. The specification of the deterministic terms depends on the assumed behavior of yt under the alternative hypothesis of trend stationarity. Under the null hypothesis, yt is I(1) which implies that $\Phi = 1$. Alternatively, the more general and robust ADF (augmented Dick-Fuller) test regression where both drift and trend are included, can be formulated as;

$$\Delta Y_t = ?2_0 + ?3_1 t + \delta Y_{t-1} + \sum_{j=1}^{p} \Psi_j \Delta Y_{t-j} + \varepsilon_t \qquad (2.4)$$

Where $\delta = \Phi - 1$. Under the null hypothesis, Δyt is I(0) which implies that $\delta = 0$. The ADF t-statistic is then the usual t-statistic for testing $\delta = 0$ and the ADF normalized bias statistic is

$T\delta/\hat{}(1-\psi\hat{}1-\cdots-\psi\hat{}p)$. The null hypothesis of ADF is $\delta = 0$ against alternative hypothesis that $\delta < 0$. Where, $\delta = \Phi - 1$. A rejection of this hypothesis means that the time series is stationary or does not contain a unit root while not rejecting means that the time series is non-stationary (Enders, 1995)

2.3.3. Co-integration test

The discussion of spurious regression makes it obvious that it is important to be able to test whether a set of p variables, x_{1t}, x_{2t}, ..., x_{pt}, are cointegrated or not. If the variables are cointegrated we can use different methods suggested in different literatures for estimation and inference on the equilibrium relation. If the variables do not cointegrate, the regression model is useless and should be disregarded or changed to obtain cointegration.

Once variable have been classified as integrated of order I(0), I(1), I(2) etc. It is possible to set up models that lead to stationary relations among the variables, and where standard inference is possible. The necessary criterion for stationarity among non-stationary variables is called cointegration.

A vector of I(1) variables yt is said to be cointegrated if there exist a vector βi such that βiyt is trend stationary. If there exist r such linearly independent vectors βi, i = 1,...,r, then yt is said to be cointegrated with cointegrating rank r. The matrix β = (β1, …βr) is called the cointegrating matrix. Testing for cointegration is necessary step to check whether the model has empirically meaningful relationships. If variables have different trends processes, they cannot stay in fixed long-run relation to each other, implying that the long-run dynamics of the variables cannot be modeled, and there is usually no valid base for inference based on standard distributions.

2.3.3.1. Engel-Granger (Two step) Procedures

Generally, since we have found most of the variables to be non-stationary – I(1) variables, hence, any equilibrium theories that involve these variables require the existence of a combination of the variables to be stationary. Otherwise, any deviation from equilibrium will not be temporary. The Engle-Granger (EG) two-step procedure was first proposed in the seminal article by Engle and Granger (1987), and follows two distinct steps. Step 1 of the EG involves a preliminary test for the cointegratability of the variables involved and then, followed by the error correction term estimation. The preliminary test for cointegratability of the variables is based on the application of OLS to the equations and the consequent application of unit root tests on the OLS residuals. Step 2 on the other hand, makes use of the estimated error and formulates the error correction model (Patrick k. Watson, 2002).

The EG two-step procedure is very attractive to the applied economist largely because of its apparent simplicity. It separates the estimation of the long run parameters from those of the short run and requires, in each instance, the use of standard OLS methods. Apart from its simplicity, it is subject to the following limitations. First, it uses the residual of the static model which is already suspected of being spurious for the error correction model. Second, it implicitly assumes that there is only one co-integrating vector. Due to these limitations, this paper chooses to use the Johanson maximum likelihood procedure (1988) than E-G method, since Johanson maximum likelihood procedure addresses all these limitations.

2.3.3.2. Johansen (1988) Maximum Likelihood Procedure

Johansen's procedure builds cointegrated variables directly on maximum likelihood estimation instead of relying on OLS estimation. This procedure relies heavily on the relationship between the rank of a matrix and its characteristic roots. Johansen derived the maximum likelihood estimation using sequential tests for determining the number of cointegrating vectors. His method can be seen as a secondary generation approach in the sense that it builds directly on maximum likelihood instead of partly relying on least squares. In fact, Johansen's procedure is nothing more than a multivariate generalization of the Dickey-Fuller test (Rajab, Ssekuma, 2011).

Based on Johansen's framework, the variables involved in this study can be represented as a vector auto-regression as;

$$\begin{bmatrix} \Delta LGDP_t \\ \Delta LDS_t \\ \Delta LDSTCK\,(sqr)_t \\ \Delta LDSTCK_t \\ \Delta LEDU_t \\ \Delta LGCF_t \\ \Delta LOPEN_t \\ \Delta LCPI_t \\ \Delta LB\_DFCIT_t \\ \Delta LMS_t \end{bmatrix} = \Gamma_i \begin{bmatrix} \Delta LGDP_{t-i} \\ \Delta LDS_{t-i} \\ \Delta LDSTCK\,(sqr)_{t-i} \\ \Delta LDSTCK_{t-i} \\ \Delta LEDU_{t-i} \\ \Delta LGCF_{t-i} \\ \Delta LOPEN_{t-i} \\ \Delta LCPI_{t-i} \\ \Delta LB\_DFCIT_{t-i} \\ \Delta LMS_{t-i} \end{bmatrix} + \alpha\beta' \begin{bmatrix} LGDP_{t-i} \\ LDS_{t-i} \\ LDSTOCK\,(sqr)_{t-i} \\ LDSTCK_{t-i} \\ LEDU_{t-i} \\ LGCF_{t-i} \\ LOPEN_{t-i} \\ LCPI_{t-i} \\ LB_{DFCIT_{t-i}} \\ LMS_{t-i} \end{bmatrix} \quad \ldots\ldots\ldots (2.7)$$

Given the above formulation, the rank of the matrix Γ determines the number of cointegrating vectors between the variables.

It has the advantage over the Engle-Granger and the Phillips-Ouliaris methods in that it can estimate more than one cointegration relationship, if the data set contains two or more time series. The multivariate test is based on a VAR, not a single OLS estimation as with the Engle-Granger approach. Consequently, he proposes two different likelihood ratio tests namely

- The trace test, which is written as

$J_{trace} = -T\sum_{i=r+1}^{n} \ln(1-\lambda_i)$

The maximum eigen value test.

J_{max} = -Tln(1-??$_{r+1}$)

Where, T is the sample size and ??$_i$ is the i.th largest canonical correlation. The Trace test tests the null hypothesis of r cointegrating vectors against the alternative hypothesis of n cointegrating vectors. Whereas, the maximum eigen value test tests the null hypothesis of r cointegrating vectors against the alternative hypothesis of r+1 cointegrating vectors.

The Johansen trace test is used to test for the existence of cointegration and is based on the estimation of the vector error correction model (VECM) by the maximum likelihood, under various assumptions about the trend or intercepting parameters, and the number k of cointegrating vectors, and then conducting likelihood ratio test. Assuming that the ECM errors are independent $N_m(0,\Sigma)$ distribution, and given the cointegrating restrictions on the trend or intercept parameters, the maximum likelihood $L_{max}(k)$ is the function of the cointegration rank k. the trace test is based on the log-likelihood ratio ln($L_{max}(k)$/ $L_{max}(k)$), and is conducted sequentially for k= m-1…..1, 0.

The Maximal Eigen value test on the other hand, conducts separate tests on each eigen value. The null hypothesis is that there are *r* cointegrating vectors present against the alternative that there are (*r* + 1) present. Like the trace test, the distribution of maximum eigen value test statistics is non-standard.

2.3.4. VECM SPECIFICATION

Conditional on the stationarity and cointegration tests above, the autoregressive of order P model (AR(p)) can be established as follows

$$y_t = V + A_1 Y_{t-1} + A_2 Y_{t-2} + ... + A_p Y_{t-p} + \xi_t, \quad \xi \sim IN(0,\Sigma) \quad \text{..... (2.8)}$$

where y_t is a K X 1 vector of variables, v is a KX1 vector of parameters, $A_1 \ldots A_p$ are KX K matrices of parameters, and ζ_t is a KX1 vector of disturbances. ζ_t has mean 0 and covariance matrix Σ, and is i.i.d. normal over time. Any VAR(p) can be rewritten as a VECM form as

$$\Delta y_t = V + \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \xi_t \text{ Where } \Pi = \sum_{j=1}^{j=p} A_j - I_k \text{ and } \Gamma_i = -\sum_{j=i+1}^{j=p} A_j$$

Δ is the first difference operator

y stands for all variables included in the model; (GDP, Debt service, debt stock and its square, education, gross capital formation, degree of openness, budget deficit, CPI and broad money supply)

Engel and Granger (1987) showed that if the variable Y_t is I(1) the matrix Π in equation () has rank 0≤ r≤ k where r is the number of linearly independently cointegrating vectors. If cointegration does exist, it implies 0 < r < k.

Assume that Π has reduced rank 0 < r < K so that the above equation can be expressed as

$$\Delta y_t = V + \alpha\beta' Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \xi_t$$

where $\alpha and \beta$ are speed of adjustment and a long run parameters respectively having rxk matrices of rank r

2.3.5. Granger causality

Differentiating the causal relationship among economic variable is one of the most important and yet one of the most difficult issues in empirical investigation. The difficulty, according to Jin-Lung Lin (2008), arises from the none experimental nature of social science data. To look at the basic "Granger Causality" definition, Suppose that we have three terms, X_t , Y_t , and W_t , and that we first attempt to forecast X_{t+1} using past terms of X_t and W_t . We then try to forecast X_{t+1} using past terms of X_t, Y_t ,and W_t . If the second forecast is found to be more successful, then it implies the past values of Y appears to contain information helping in forecasting the future values of X that is not in past values of X_t or W_t. Thus, Y_t would "Granger cause" X_{t+1} if Y_t occurs before X_{t+1} and it contains information useful in forecasting X_{t+1} that is not found in a group of other appropriate variables (Clive Granger, 2003).

The definition leans heavily on the idea that the cause occurs before the effect, which is the basis of most, but not all, causality definitions. Some implications are that it is possible for Y_t to cause X_{t+1} and for X_t to cause Y_{t+1} , a feedback stochastic system. However, it is not possible for a determinate process, such as an exponential trend, to be a cause or to be caused by another variable.

Thus Granger causality test for our variables in the growth model involves the estimation of the following VAR model;

$$a??LGDP_t = B_1 + \sum_{j=1}^{p} \beta_{1j}\Delta LGDP_{t-j} + \sum_{j=1}^{p} \beta_{2j}\Delta LDS_{t-j} + \sum_{j=1}^{p} \beta_{3j}\Delta LDSTCK_{t-j} + \sum_{j=1}^{p} \beta_{4j}\Delta Z_{t-j} + \varepsilon_{1t}$$

$$a??LDS_t = B_2 + \sum_{j=1}^{p} \alpha_{1j}\Delta LDS_{t-j} + \sum_{j=1}^{p} \alpha_{2j}\Delta LGDP_{t-j} + \sum_{j=1}^{p} \alpha_{3j}\Delta LDSTCK_{t-j} + \sum_{j=1}^{p} \alpha_{4j}\Delta Z_{t-j} + \varepsilon_{2t}$$

$$a??LDSTCK_t = B_3 + \sum_{j=1}^{p} \gamma_{1j}\Delta LDSTCK_{t-j} + \sum_{j=1}^{p} \gamma_{2j}\Delta LDS_{t-j} + \sum_{j=1}^{p} \gamma_{3j}\Delta LGDP_{t-j} + \sum_{j=1}^{p} \gamma_{4j}\Delta Z_{t-j} + \varepsilon_{3t}$$

$$a?\,?LZ_t = B_4 + \sum_{j=1}^{p} \delta_{1j}\Delta Z_{t-j} + \sum_{j=1}^{p} \delta_{2j}\Delta LDSTCK_{t-j} + \sum_{j=1}^{p} \delta_{3j}\Delta LDS_{t-j} + \sum_{j=1}^{p} \delta_{4j}\Delta LGDP_{t-j} + \varepsilon_{4t}$$

Where Z_t represents the vector of control variables in the growth model and ε's are assumed to be white noise process

By estimating the above VAR model and by testing the statistical significance of each coefficient in the above model, different possible conclusions can be drawn. For example, if $?\,2_{2j}$ is statistically insignificant in the model above, it implies that external debt service doesn't granger cause economic growth.

3. ESTIMATION RESULTS AND INTERPRETATION

3.1. Stationarity test result

As it is discussed in chapter four, non stationarty of time series data has often been regarded as a problem in empirical literature as working with non-stationary variables leads to spurious regression result, from which further inferences are meaningless. Hence the first task in this paper is testing whether the variables included in the model are stationary or not. The stationarity of the series is investigated by employing the Augmented Dickey-Fuller (ADF) unit root test. Since unit root tests are sensitive to the presence of deterministic regressors, three models are estimated. The most general model with a drift and time trend is estimated first and restrictive models i.e. with a constant and without either constant and trend, respectively, are estimated. Unit root tests for each variable, is performed on both levels and first differences. The null hypothesis in the test claims that the series under investigation has unit root while the alternative hypothesis on the other hand, claims that the series under investigation is stationary. The results of the test for the variables at level and first difference are presented in Table 3.1 and 3.2 below respectively.

Table 3.1 unit root test for the variables at level

Variables	Augmented Dickey-Fuller (ADF) test							
	Lag length 1				Lag length 2			
	D		T&D		D		T&D	
	Test stat	p. value	Test stat	p. value	Test stat	p. value	Test stat	p. value
LGDP	2.57	0.99	-0.53	0.98	3.69	0.99	0.08	0.99
LDS	-0.57	0.28	-0.95	0.95	-0.54	0.30	-0.93	0.95
LDSTCK	-1.53	0.07	-2.34	0.41	-0.85	0.20	-1.96	0.62
LEDU	-0.46	0.32	-0.46	0.98	-0.45	0.32	-0.26	0.99
LGCF	-0.98	0.17	-0.83	0.96	-1.14	0.13	-0.93	0.95
LOPENNESS	-1.37	0.09	-1.78	0.71	-1.14	0.13	-1.73	0.74
LCPI	1.52	0.93	-0.52	0.98	1.78	0.96	-0.19	0.99
LB_DEFICIT	-0.70	0.24	-2.50	0.33	0.03	0.51	-2.13	0.53
LMS	1.06	0.85	-2.45	0.35	1.05	0.85	-2.01	0.59
Critical values	***1%*** -2.45	***5%*** -1.69	***1%*** -4.29	***5%*** -3.56	***1%*** -2.46	***5%*** -1.69	***1%*** -4.30	***5%*** -3.56

D refers to drift term
T&D refers to both stochastic trend and drift terms
p.value stands for MacKinnon approximate p-value

Source: stata estimate

According to the augmented Dickey and Fuller (ADF) test result presented in table 3.1 above, all variables in the growth model are non-stationary at level implying that there is a unit root problem. At different lag length (lag 1 and 2) with alternative models, with drift and trend terms included alternatively, the null hypothesis, which claims the presence of unit root, cannot be rejected at any level because of the fact that some of the test statistics are positive and, even if they are negative; on absolute term, they are less that the critical values both at 1 and 5 percent level of significance. The null hypothesis would have been rejected if the test statistics had been negative and greater than the critical value on absolute terms.

Table 3.2 unit root test for the variables at first difference

Variables	Augmented Dickey-Fuller (ADF) test							
	Lag length 1				Lag length 2			
	D		T&D		D		T&D	
	Test stat	p. value	Test stat	p. value	Test stat	p. value	Test stat	p. value
dLGDP	-3.84*	0.00	-6.31*	0.00	-1.64***	0.05	-3.80	0.02**
dLDS	-3.80*	0.00	-3.89**	0.01	-2.73*	0.00	-2.87	0.17
dLDSTCK	-3.80*	0.00	-3.59**	0.03	-2.92*	0.00	-2.79	0.19
dLEDU	-4.10*	0.00	-4.60*	0.00	-2.68*	0.00	-3.18	0.08***
dLGCF	-4.19*	0.00	-4.38*	0.00	-3.32*	0.00	-3.75	0.02**
dLOPENNESS	-3.38*	0.00	-3.22***	0.07	-2.63*	0.00	-2.34	0.41
ddLCPI	-3.90*	0.00	-4.53*	0.00	-2.40**	0.01	-2.8	0.18
dLB_DEFICIT	-5.90*	0.00	-5.96*	0.00	-3.89*	0.00	-3.98	0.00*
dLMS	-2.82*	0.00	-2.60	0.27	-2.61*	0.00	-2.47	0.34
Critical values	***1%***	***5%***	***1%***	***5%***	***1%***	***5%***	***1%***	***5%***
	-2.45	-1.69	-4.30	-3.56	-2.46	-1.70	-4.31	-3.57

Note: * , **, *** represents a variable under consideration is stationary at 1, 5 and 10% significance level respectively
The prefix 'd' of each variable indicates first difference

Source: STATA estimate

Since all variables are nonstationary at level, additional test has been carried out by taking the first difference of the variables under consideration. As clearly reported in table 3.2 above, all variables are stationary at their first difference suggesting that they are difference stationary process and their order of integration is one (integrated of order one I(1)). Thus the variables included in the growth model, unexceptionally, are difference stationary and integrated of the same order which is one of the preconditions for cointegration test.

3.2. Optimal lag length

One of the steps in Johansen Co-integration technique involves the selection of appropriate lag length using proper information criterions. According to Stock and Watson (2007), choosing the order of lag requires balancing the benefit of including more lags against the cost of additional estimation uncertainty. On the one hand, if the order of an estimated lag is too low, it means potentially valuable information contained in the more distant lagged values might be omitted. On the other hand, including too many lags implies estimating more coefficients than necessary, which in turn introduces additional estimation error into the model. Due to these competing issues, employing a formal test is advisable. To this end, this study employs different information criteria tests to come up appropriate lag length. Except Final prediction error (FPE) and sequential modified likelihood ratio (LR), all Lag selection criterions like Aikaike information criterion (AIK), Schwarz information criterion (SC) and Hannan-Quinn information criterion (HQ), as it is reported in table 5.3, suggest an optimal lag length of 4 which has been employed in our analysis.

Table 3.3: Lag length Selection Criteria

lag	LL	LR	P	FPE	AIC	HQIC	SBIC
0	136.53			2.8e-15	-7.97	. -7.83	-7.55
1	367.08	461.1	0.00	3.0e-19	-17.31	-15.95	-13.19
2	456.92	179.6*	0.00	7.0e-19	-17.87	-15.27	-10.03
3	….	…..	….	-5.0e-96*	….	……	…….
4	8717.26	…...	…..	…..	-526.82*	-522.45*	-513.63*

* Indicates the corresponding lag order selected by the criterion
LR: sequential modified likelihood ratio test statistic (each test at 5percent level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Source: stata estimate

Based on the table above, majority of the information criteria suggests the optimal lag length to be 4 while

sequential modified likelihood ratio test and final prediction error criteria tend to underestimate the optimal lag length by suggesting two and three lags respectively.

3.3. Co-integration among the variables

At this stage, the Johansen's cointegration test was employed to determine whether there exist a long run equilibrium relationship between growth variable and debt variables and the test result is reported in the following table.

Table 3.4: Trace Statistics

Unrestricted Co-integration Rank Test (Trace)				
Maximum Rank (r)		**Trace Statistic**	**5 % Critical Value**	**Decision**
Ho: r =0	Ha: r = 1	288.08	192.89	Reject Ho
Ho: r ≤ 1	Ha: r = 2	184.24	156.00	Reject Ho
Ho: r ≤ 2	Ha: r = 3	136.48	124.24	Reject Ho
Ho: r ≤ 3	Ha: r = 4	94.64	94.15	Reject Ho
Ho: r ≤ 4	Ha: r = 5	66.94*	68.52	Accept Ho

Source: own computation

The Johansen's Trace Statistics (λ_{trace}) is used to determine the existence of co-integration and the number of co-integrating vectors. This statistics confirms the existence of co-integration and numbers of co-integrating vectors identified are four. The Trace-test Statistics 288.08 corresponding with r=0, is greater than the critical value of 192.89 at 5 percent significance level implying, the null hypothesis ($r = 0$) of no cointegration is rejected in favor of the alternative hypothesis $r= 1$. By the same token, the null hypothesis of $r \leq 1$, $r \leq 2$, and $r \leq 3$ are also rejected in favour of their respective alternative hypotheses because trace statistics are greater than the critical values at 5 percent level of significance. But at $r \leq 4$ we fail to reject the null hypothesis, suggesting that the system has four cointegrating vectors which also ensure the existence of multiple long run equilibrium relationship among the variables under consideration.

3.4. Long run parameters (β COEFFICIENTS)

The long run estimated coefficients (elasticities) of variables included in the model are reported in table 3.5. First column is showing the names of variables, similarly, coefficients, and Z-statistics are displayed in 2nd and 3rd column respectively whereas the last column represents the p. values of the estimates.

Table 3.5: Johansen Long run Results (β COEFFICIENTS)

Variables	Coefficients	Z. values	P. values
LDS	-0.648	-14.17	0.00
LDSTCK	0.971	2.71	0.00
LDSTCK(Sqr)	-0.091	-1.82	0.06
LEDU	0.169	3.93	0.00
LGCF	0.673	10.12	0.00
LOPENNESS	-0.210	-10.01	0.00
LCPI	0.813	11.07	0.00
LB_DEFICIT	-0.273	-12.16	0.00
LMS	-0.371	-11.72	0.00
Cons	-7.523	…..	…..

Equation	*RMSE*	*R-sq*	*chi2*	*P>chi2*
D_gdp	*0.024462*	*0.7048*	*52.53213*	*0.0000*

Diagnostic tests:

Autocorrelation at d/t lag order:	***chi2***	***Prob > chi2***
At lag 1:	*37.54*	*0.85*
At lag 2:	*61.57*	*0.94*
Normality test:		
Jarque-Bera test	*1.04*	*0.59*
Skewness test	*0.99*	*0.31*
Kurtosis test	*0.05*	*0.81*

Portmanteau test for white noise: Q-statistics =7.19 (p-value= 0.95)

Breusch-Pagan Heteroscedasticity test: chi2(1) = 0.02 Prob > chi2 = 0.8843

Source: STATA output

As it is clearly presented in table 3.5 above, all variables of the growth equation are statistically significant at 1 percent except the squared of external debt stock which is rather significant only at 10 percent significance level. The estimated result reveals that both the previous debt stock and servicing have a strong impact on the long run steady state. The percentage change in debt service has a negative long run relationship with real GDP growth. The elasticity of Real GDP growth rate With respect to Debt service is -0.648 which implies that a percentage change in the external debt servicing causes GDP growth to decline by 0.65 percent. The negative effect of current debt service on economic growth was as expected, based on both theoretical and empirical basis. This finding is partly in line with the finding of Mulugeta (2014) who came up with a negative and significant long run relationship between external debt servicing and economic growth using the Johansen's maximum likelihood method. And there are plenty of research findings from outside of the country whose finding is in conformity with this finding.

Debt stock on the other hand has a positive relationship to the growth rate of the economy having a long run elasticity parameter of 0.971 which is statistically significant at 1 percent level. It implies that a one percent increase in the past external debt accumulation will increase the real GDP by about 0.97 percent. For the positive relationship between debt stock and real per-capita GDP, it can be justified that due to higher financial inflow in terms of foreign currency, more funds would be available to be invested in the economy which would in turn facilitate economic growth of the country. Though this finding is highly against the findings of many researchers from Ethiopia and the rest of the world, it might not be somehow, too far from the reality, given the fact that the country is highly dependent on the imported capital goods to be used in a domestic investment and the bottle neck associated with lack of foreign currency would be partly resolved due to deb obtained from external world. This finding coincides with the findings of Hana Argaw (2013) and Melese Gizaw (2005) for Ethiopia case.

This finding is also in line with the reasoning of Eaton (1993), if the debt obtained is to be invested, theoretically, it is expected that the marginal product of capital is higher than the world interest rate for developing countries and then, such countries would benefit from external borrowings. According to Eaton, the impact of external debt is likely dependent on where the fund is assigned rather than on 'how much fund is borrowed' implying that the government's commitment which in turn depends on the country's institutional set up is what matters the most in determining the impact of external debt stock on economic growth.

Despite the positive impact of external debt stock on economic growth, the square of the debt stock has a negative impact on growth suggesting that there exist a non-linear relationship between external debt stock and economic growth exhibiting an inverted 'U' shape relationship between the two variables. Based on this finding one can conclude that the external debt stock would only be blessing for a country only until certain amount and if that threshold is breached it would no longer be a blessing. This finding is supported by the finding by Markus Ahlborn et al (2016), Mencinger Jernej et al (2014) and Stephen G Cecchetti et al (2011) for different European countries and there is no additional evidence for Ethiopia, mostly because of the model specification adopted by the previous researchers which are customarily linear.

The indicator of the degree of openness of the country has unexpected negative and significant relation to growth rate of Real per-capita GDP whereas expenditure on education which serves as a proxy for human capital, and the gross capital formation have both a positive sign as expected.

The annual inflation as measured by consumer's price index (CPI), exerts a positive and significant long run impact on economic growth. This finding has got many empirical and theoretical supports that a moderate inflation level has stimulating impact on economic growth.

Broad money supply and government budget deficit have a deterrent impact on economic growth being statistically significant at 1 percent level

3.5. Vector Error Correction Model (Short run Results)

Table 3.6 discusses the short run results using vector error correction model (VECM). Values without brackets are short run coefficients brackets are denoting the respective P-values. The most important thing in the short run results is speed of adjustment term. It measures how long would it take for the system for complete convergence to its long run steady state values.

Table 3.6: Vector Error Correction Short run results

Variables	Lag length		
	Lag 1	**Lag 2**	**Lag 3**
dLDS	-0.280** (0.04)	-0.304* (0.00)	-0.175* (0.00)
dLDSTCK	0.046 (0.41)	-0.54** (0.01)	0.34** (0.03)
dLEDU	0.28 (0.04)	0.67** (0.01)	0.26 (0.06)
dLGCF	0.23* (0.00)	0.51** (0.02)	0.29 (0.12)
dLCPI	0.56** (0.04)	1.47** (0.01)	-0.13 (0.18)
dLB_DEFICIT	-0.29** (0.02)	-0.15** (0.01)	-0.10** (0.02)
ECT$_{(-1)}$	-0.067** (0.03)		

Equation	*RMSE*	*R-sq*	*chi2*	*P>chi2*
D_gdp	*0.024462*	*0.7048*	*52.53213*	*0.0000*

Durbin-Watson d-statistic(10, 36) = 1.720384

Source: STATA output

*Note: Numbers without brackets are the short run coefficients of corresponding variables; ( ) are P-values and; * and ** represents the coefficient is significant at 1% and 5% significance level respectively. ECT stands for speed of adjustment.*

As reported in the table above the equilibrium error term (ECT) has the right sign, being negative. The negative sign of speed of adjustment term shows that the previous deviation would converge towards its long run steady state while the result is not surprising, cognizant of the cointegration test result. While it is statistically significant at 5%, the system converges (adjusts itself) at a very slow speed of 7 percent per annum. Then one can conclude that, though the speed of adjustment got the right sign (negative), the system adjusts to its past disequilibrium with a slow speed. On the other hand, the short run VEC result reveals that almost all variables are statistically significant at 5 percent level at both lag one and two. In line with the long run results, debt service has a negative impact on economic growth at all lags while debt stock alternates its sign from positive to negative at lag one and two. So the short run dynamics would be significantly explained by both debt stock and debt service. A one percent rise in a one year lagged value of debt service causes the real GDP growth to fall by 0.28 percent while a one percent rise in one period lagged values of the past debt stock causes economic growth to increase by 0.046 percent other things held constant.

The positive economic contribution of external debt stock in the short run has got other empirical support. Along with others, Marta Gómez, et al (2015) in their attempt to test the short and long run effect of public debt on economic growth for European economies, concluded that there exists a positive short run impact of debt stock on economic growth while its impact changes in the long run.

On the other hand, expenditure on education (EDU), gross capital formation (GCF) and inflation (CPI) exert a positive impact on economic growth in the short run. An increase in a one period lagged value of EDU causes economic growth to increase by 0.28 percent and its impact increases to 0.67 percent when the lag length increases to two.

Budget deficit has a negative and significant impact on the short run dynamics of the growth and its impact continuously gets weaker as lag length increases. A one percent increase in the one period lagged values of the budget deficit causes the real GDP growth to fall by a 0.29 percentage point. Other variables such as DSTC(sqr), money supply and openness are statistically insignificant and hence they are not explaining a short run dynamics of the model.

3.6 Granger causality test result

Granger causality test is employed in order to check the existence of the causal relationship among our dependent variable (GDP) and explanatory variables of which special attention is given to the debt variables (external debt stock and service)

Table 3.7: Granger causality test results

Null hypothesis	*F statistics*	*Prob-F*	*Decision*
Ds doesn't granger cause GDP	*6.06*	*0.04*	*Reject*
Debt stock does not granger cause GDP	*2.73*	*0.25*	*Accept*
GDP doesn't granger cause Debt service	*2.77*	*2.25*	*Accept*
GDP doesn't granger cause Debt stock	*1.13*	*0.56*	*Accept*

Source: STATA estimate

The estimation result confirms that external debt service Granger causes economic growth while past debt stock doesn't Granger cause economic growth. On the other hand the non-existence of the causal relation drawn from growth variable to debt variable is confirmed by the estimation implying that the cause-effect relationship between external debt and economic growth is only unidirectional going from debt to economic growth. To this end, external debt stock has a neutral effect in the short run.

Finally, given the estimation results of vector error correction model which yields a negative short run relation between economic growth and external debt servicing, and the Granger causality test results, the question that whether high debt service causes low economic growth or low economic growth causes high debt servicing can now be answered. Based on the Granger causality estimation results, one can conclude that it is the high debt servicing which is responsible for low economic growth, not the other way round.

4. CONCLUSSION AND POLICY IMPLICATIONS

4.1. Conclusion

The perceived lack of conclusive quantitative evidence on the macroeconomic effects of debt stock in low-income countries has generally blurred the impact of an increasing debt stock on the country's macroeconomic situation and therefore left the issues of its effectiveness and efficiency open to debate and dispute. Though, many empirical studies have investigated the effect of external debt on economic growth, some end up finding a negative impact on economic growth while others do not find any significant relationship between economic growth and external debt. Most of these studies have used real GDP and GDP growth rate as dependent variables and tried to explore the direct impact of external debt servicing as well as external debt stock on GDP growth rate. Nevertheless, the findings of these studies are mixed at best; therefore, in this scenario it is hard to say whether external debt has positive, negative or any significant impact on economic growth in general and then the country specific impact of the variables are essential.

This study takes a look at a long-run impact of external debt stocked and debt service payment on the economic growth in the country. Time series data from 1981/82 to 2015/16 of relevant variables were used for empirical analysis. First of all, stationarity of time series was checked by using Augmented Dickey-Fuller (ADF) unit root test. All variables are found at most, to be integrated of order one I(1) as they became stationary at their first differences at 1and 5 percent level of significance. As the variables had same order of integration, Johansen co-integration was applied to find the long run relationships. Trace Statistics λ_{trace} was used. This statistics confirmed the existence of multiple co-integrations, having four co- integrating vector.

Vector Error Correction model was applied to estimate the long run elasticities along with short run dynamics. Based on the estimated results, the long run impact of all variables on the growth rate of Real GDP was statistically significant strong. The main findings of this research are that External debt accumulation has a significant positive effect on economic growth in the long run while when it is squared its impact turn out to be negative and significant, suggesting that the debt stock after some optimum level would no longer be a blessing for a country. As hoped by the government and the lending agencies that the long run impact of external debt would be positive as most of it is allocated to public investments; such as roads, electricity, education and health sector which are expected to yield higher return in the long run, unfortunately, this benefit would be feasible only for some optimum level of debt stock and the benefit banishes at some point.

Debt service on the other hand, showed a negative relationship with the economic growth in conformity with theory and expectation. This outcome may be due to its extreme effects on the macroeconomic factors responsible for the growth. External debt servicing offsets the investments by creating a crowding out effect and debt overhang problem. This study is showing negative long run relationship between external debt servicing and per-capita GDP which might be mainly due to the transfer of resources in the payment of debt than on the investments. The more the external debt payments, the lesser will be funds raised for public services such as the construction of roads, hospitals, schools and new business opportunities in the long run. It is not surprising to face this result since

external debt servicing requires the outflow of financial resources in terms of foreign currencies which is already extremely deficient in supply.

Even though the debt stock, however, has a significantly strong positive relationship with real output growth confirming the beneficial impact of debt in the country, the debt burden of a country and the consequent debt service impose a constraint on the economy in terms of insufficient foreign exchange to finance imports of raw materials and capital goods needed for economic growth in the long run as well the debt stock may act as a tax on future income and production and may discourage investment by the private sector in the future.

The results of the short run dynamics show along with the long run impact, debt service has a negative and significant impact on the growth rate. Debt stock on the other hand, has temporarily a positive impact in the short run while its sign alternates with lag length.

4.2. Policy implications

Based on the discussion above the following policy implications can be drawn.

- Government's further increased mobilization of resources from external source in the form of debt and moreover, the wise and proper utilization by investing on selective and productive sectors including basic infrastructural developments that facilitate the productivity of other sectors of the economy would have a positive long run impact on the growth of the country. Because there is nothing wrong with borrowing as long as the funds are used in a systematic and productive manner, rather what matters more is where the borrowed fund is allocated and how much it is productive.
- The government has to pay attention in maintaining the level of external debt stock at a reasonably optimum state in accordance with the country's capacity to pay.
- Appropriate Policies and strategies should go hand in hand in increasing the country's capacity to repay its debt obligation through promoting export sector in the short run and minimize the dependency of a country on external sources in the long run.
- Despite the positive relation between capital inflow in the form of external debt and the long run growth rate, emphasis has to be given on smoothing the burden of the debt repayment profile of the country in order to minimize the risk associated with the outflow of domestic capital which is needed to service external debt as it is a drag on an economy's long run economic growth.

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