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External debt and economic growth in the East Africa community

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Using annual data from 1970-2010, this paper employs a panel fixed-effects model to estimate the effect of external debt, as a share of Gross Domestic Product (GDP), on economic growth in East Africa Community (EAC). This study was based on the Solow growth model augmented for debt. The Levin-Lin-Chu test (LLC) approach was used to investigate the properties of the data with respect to unit roots. The Hausman specification test was used to verify the panel fixed-effects model. The findings suggest that external debt has a negative significant effect on per capita GDP growth rate in the EAC. The policy implication is therefore to reduce the external debt burden so as to promote rapid economic growth of the EAC member countries.

Key words: External debt, economic growth, East African Community.

INTRODUCTION

External Public Debt is debt owed to external creditors. Among them are multilateral creditors such as International Development Association (IDA), Africa Development Bank (AfDB), World Bank (WB), International Monetary Fund (IMF) and other International Financial Institutions. Others are bilateral creditors which are essentially other countries; for example Japan, Italy, Germany, as well as commercial creditors essentially private institutions, for example, Standard Bank United Kingdom.

The East African Community (EAC) is among the fastest growing regions. Growth rates have picked up strongly in the EAC countries over the last two decades, outpacing the rest of Sub-Saharan African (SSA) since 2000. During 2005–2010, per capita income growth

reached 3.7 percent a year in the EAC, compared to 3.2 percent for the SSA as a whole, and almost quadruple the rate achieved in the previous 15-year period. Part of the recent high growth is “catching up” after years of very poor growth. In the last part of the 20th century the region suffered periods of severe civil strife and bouts of economic instability. Since then, the region has been committed to strong policies.

However, growth within the EAC has been uneven. Rwanda, Tanzania, and Uganda have had the longest periods of high growth. Uganda’s growth acceleration started earlier than in the other countries and has lasted more than 20 years, with per capita income growth averaging 3.4 percent a year during 1990–2010. Growth in Rwanda and Tanzania has been strong since the early

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2000s. After a period of stagnation, growth is picking up in Kenya-the largest of the five economies-averaging 1.9 percent a year since 2005 compared to minus 0.2 percent in 1990–2004, providing momentum for the region as a whole. Output declined in Burundi in most of the period since 1990 reflecting periods of political conflict but has shown signs of recovery in recent years (McAuliffe et al., 2012).

In Kenya, the early 1980s were characterized by high budget deficits, high inflation, and unsustainable current account deficits. These financial imbalances were triggered by, among other things, the erosion of fiscal discipline following an expansionary fiscal policy implemented after the coffee boom of 1977-78 and severe external shocks (oil shocks) - external debt rose by more than 78 percent between 1974 and 1978 owing to increased import bills (precipitated by the inflation caused by the oil crisis), implications of the break-up of the EAC in 1977 and construction of Kasarani Sports Centre. During this period, the ratio of public expenditures to GDP increased from 24 percent in 1973-74 to over 31 percent in 1979/80 while the deficit increased from 3 to 10 percent of GDP (Kiringai, 2001).

A major external factor in Uganda's debt crisis is the dramatic decline in export receipts due to declining coffee prices and unfavourable terms of trade. The price of coffee (the major export) decreased steadily from 1985 to 1993 and Uganda suffered annual declines in its terms of trade every year from 1986 to 1992. The decline in the terms of trade resulted in a sharp increase in Uganda's debt service to exports ratio, which was over 60 percent between 1988 and 1993. Another major cause of debt was the high level of donor financed development expenditures. The reliance of the adjustment effort adopted in 1987 on external financing has created a larger debt burden for Uganda, with the external debt more than doubling during the adjustment period from US\$1,659 million to \$2.9 billion as of June 1994. Most of this increase was attributable to credits obtained from multilateral institutions to support the balance of payments and finance development projects. Multilateral debt as of June 1994 accounted for about 71 percent of the total debt stock, compared with about 43 percent in 1987 (Mbire and Atingi, 1997).

According to Economic and Social Research Foundation (ESRF) (1998), the debt crisis of the 1980s in Tanzania is explained by both external and domestic factors. These include: temporary high commodity prices and trade booms which led to increased foreign income earnings which, in turn, leveraged borrowing credibility, availability of cheap loans and credits abroad, particularly in the 1970s, expensive expenditure programmes in developing countries and huge expansion of state-owned sector of the economy in the 1970s which did not perform with excellence.

Rwanda's external debt of the central government at the end of 2010 was 14.6 percent of GDP, including a

small fraction which is guaranteed by the central government (0.4 percent of GDP). Multilateral creditors hold more than 80 percent of all central government external debt, with the lion share held by IDA and ADB for a combined 55 percent. Domestic public debt (including central government and the central bank) was 8.9 percent of GDP at the end of 2010, of which nearly half (4.3 percent of GDP) were short-term maturities (IDA and IMF, 2011).

Burundi's Nominal external public and publicly guaranteed debt amounted to 27.4 percent of GDP in 2009. About 90 percent of outstanding nominal external public and publicly guaranteed debt was owed to multilateral creditors, with bilateral creditors accounting for the remainder. The central government debt as a ratio of GDP in the year 2010 was 36.73 percent, with internal and external debts being 5.02 and 31.72 percent of GDP respectively. The government allocates resources made available from debt relief to finance spending in areas critical to meeting Millennium Development Goals (IDA and IMF, 2010).

LITERATURE ON EXTERNAL DEBT AND GROWTH

Theoretical literature

The theory holds that both the stock of external debt and its service (the payment of interest and repayment of principal) affect growth by discouraging private investment or altering the composition of public spending. Higher external interest payments can increase a country's budget deficit, thereby reducing public savings if private savings do not increase to offset the difference. This, in turn, may either drive up interest rates or crowd out the credit available for private investment, depressing economic growth. Debt service may discourage growth by squeezing the public resources available for investment in infrastructure and human capital (Clements et al., 2005).

The theory further suggests that external debt may have nonlinear effects on growth, either through capital accumulation or productivity growth. According to the "debt overhang" hypothesis, there is some likelihood that in the future debt will be larger than the country's repayment ability; expected debt-service costs will discourage further domestic and foreign investment. Potential investors will fear that the more there is production, the more they will be "taxed" by creditors to service the external debt, and thus they will be less willing to incur investment costs today for the sake of increased output in the future (Krugman, 1988).

Servén (1997) argues that high debt stocks create uncertainties especially in low-income counties with debt servicing difficulties. In highly uncertain and unstable environments, investors continue to exercise their option of waiting when considering whether to invest in costly

irreversible projects. Due to high uncertain environment, resources are likely to be misallocated and poor quality investments undertaken which slows productivity growth.

Empirical Literature

Most of the studies that have looked at the impact of external debt on economic growth in developing economies have been driven by the “debt overhang” hypothesis, a situation where a country’s debt service burden is so huge that a large portion of output accrues to foreign lenders and consequently creates disincentives to invest (Krugman, 1988). Imbs and Ranciere (2009) and Pattillo et al. (2004) used a two-stage least squares and differenced generalized method of moments (GMM) to estimate a standard growth model over the period 1969-98. They find a nonlinear effect of external debt on growth: that is, a negative and significant impact on growth at high debt levels (typically, over 60 percent of GDP), but an insignificant impact at low debt levels. In contrast, Cordella et al. (2005) find evidence of debt overhang for intermediate debt levels, but an insignificant debt-growth relationship at very low and very high levels of debt.

Iyoha (1999) takes a simulation approach to investigate the impact of external debt on economic growth in sub-Saharan African countries using a small macroeconomic model estimated for 1970-1994. The study shows that external debt has adverse effect on investment. The study also pointed out that reduction in debt stock would lead to improvement in investment and economic growth. The author stressed that debt of these countries should be forgiven to stimulate economic growth.

Fosu (1999) employed an export augmented production function to investigate the impact of external debt on economic growth in sub-Saharan Africa for the 1980-1990 period. The study reveals that there is a negative relationship between debt and economic growth. However, the study shows a relatively weak negative impact of debt on investment levels.

Pattillo et al. (2002) using a large panel data set of 93 developing countries over the period 1969-1998 found empirical support for a nonlinear impact of debt on growth: at low levels, debt has positive effects on growth; but above particular thresholds or turning points, additional debt begins to have a negative impact on growth.

The empirical studies have shown mixed results on the impact of external debt on economic growth. Some studies are of the view that external debt impedes the economic growth but some are in the opinion that external debt positively affects the economic growth.

The Augmented Solow Model

According to Brauning (2003), following Mankiw et al. in 1992, it is assumed that households fix the saving and

the educational spending ratio. So we have an augmented Solow model. An increase in public debt is used to redistribute every individual’s tax burden from the youths to the middle age that increases the steady growth rate.

We assume a Cobb-Douglas technology with CRS $Y = AK^\alpha L^\beta$. Let H be human capital and N be the number of workers. Then H/N is human capital per worker, $L = (H/N)N$. Therefore, a production function is obtained as:

$$Y = AK^\alpha L^\beta$$

Output Y is used for consumption, investment, government purchases and spending on education,

$$Y = C + I + G + E.$$

Considering the public debt dynamics, the government raises loans and levies an income tax in order to finance government purchases and interest payments on public debt. The government spends a fixed share of national income on goods and services $G = gY$ with the purchase ratio g constant. In addition, the government borrows a specified portion of national income $B = bY$ with the deficit ratio b constant. The budget deficit in turn adds to public debt $\dot{D} = B$. Government pays the interest rate r on public debt D , so the public interest amounts to rD . Government imposes a tax at the flat rate t on both factor income and debt income $T = t(Y + rD)$. Thus, government budget constraint can be written as $B + T = G + rD$.

Next is the dynamics of physical and human capital accumulation. Disposable income is the sum of factor income and debt income, net of taxes respectively, $Y_d = Y + rD - T$. Human capital can be augmented by spending on education, $\dot{H} = zY_d$. By backward substitution, one obtains $\dot{K} = s(Y + rD - T) - B$ and $\dot{H} = z(Y + rD - T)$; with $B + T = G + rD$, $B = bY$ and $G = gY$, which results in:

$$\dot{K} = (1 + b - g)sY - bY \text{ and } \dot{H} = (1 + b - g)zY.$$

The model can be presented by a system of six equations.

$$Y = AK^\alpha H^\beta \tag{2.1}$$

$$Y = \frac{dY}{dt} \tag{2.2}$$

$$\dot{K} = (1 + b - g)sY - bY \tag{2.3}$$

$$\dot{H} = (1 + b - g)zY \tag{2.4}$$

$$\dot{D} = bY \tag{2.5}$$

$$bY + t(Y + rD) = gY + rD \tag{2.6}$$

Here, $\alpha, \beta, b, g, s, z, D$ and K are exogenous, where $r, t, \dot{D}, \dot{H}, \dot{K}$ and Y are endogenous.

In the steady state, physical and human capital grow at the same rate as output,

$$\dot{K} = \dot{H} = \dot{Y} \quad (2.7)$$

We obtain the steady state growth rate as,

$$\dot{Y} = \dot{K} = \dot{H} = [s(1+b-g)]^2 [s(1+b-g) - b]^\alpha A \quad (2.8)$$

METHODOLOGY

The basic regression equation that was used to estimate the relationship between debt and economic growth is of the type:

$$Y_{it} = \beta X_{it} + \gamma D_{it} + \mu_i + v_t + \varepsilon_{it} \quad (3.1)$$

Where;

Y_{it} - is the dependent variable (economic growth).

X_{it} - represent the set of explanatory variables.

D_{it} - is the debt variable (external debt).

μ_i - unobserved country-specific effects.

v_t - unobserved time-specific effects.

ε_{it} - is the error term.

The subscripts i and t represent country and time period respectively. Y_{it} represents dependent variable, that is the growth rate of GDP per capita. X_{it} is a different explanatory variable that was used. The variables are the government size, openness, level of investment and terms of trade growth. These variables are known to be consistently associated with growth.

Data

The data employed in the study consist of a panel of five countries covering the period 1970-2010. The dependent variable is real GDP per capita growth rate (economic growth) ($RGDPPG$), for the debt variable, the indicator which was used is the total external debt-to-GDP ratio (ED). Other than the debt variable, different explanatory variables were used to control other factors that influence economic growth; the variables are investment (inv), government expenditure ($gvte$), terms of trade (tot) and openness ($opns$).

Variables, measurement and sources of data

RGDPPG- Real GDP per Capita Growth. This paper uses Real GDP per capita, which is the annual percentage growth rate of GDP per capita based on constant local currency. Islam (1995) uses per capita values. Data Source: World Development Indicators (WDI) (2011) Data Base.

INV-Investments. Investment refers to the purchase of goods that are not consumed today but are used in the future to create wealth. Theoretically, Investment is the key to economic growth; if investment rises in an economy, aggregate demand also rises and therefore economic growth. Jorgenson (2003) obtained that investment in tangible assets is the most important source of economic growth in the Group of Seven (G7) nations. The contribution of capital input exceeds that of productivity for all countries for all periods. This variable is measured as a ratio of GDP. Data source: WDI (2011) Data Base.

GVTE - Government Expenditure. Government expenditure refers to general government final consumption expenditure as a share of

GDP. Larger government provides public goods; further increases in government expenditure can increase the disposable incomes of the citizens which encourages growth. However, large government spending can lead to transfer of additional resources away from the most productive sectors of the economy to government, where they are used less efficiently and thus undermining economic growth. Cooray (2009) concluded that expansion of government expenditure contributes positively to economic growth. However, a study by Barro (1991) suggested that large government expenditure has negative impact on economic growth. Data Source: WDI (2011) Data Base.

TOT - Terms of Trade. Terms of trade refers to the price of a country's exports (P_X) relative to the price of its imports (P_M), ($TOT = P_X / P_M$), where P_X is a price index for all export goods due to the fact that countries export more than one good, P_M is a price index for all import goods. Mendoza (1997) proposes a stochastic growth model whereby terms of trade uncertainty can adversely affect savings and growth. Data Source: WDI (2011) Data Base.

OPNS - Openness. Openness refers to the sum of exports and imports of goods and services as a share of GDP. According to World Bank (1993), significant growth rates are often associated with countries embracing the ongoing globalization and increasing openness to the international exchange of goods and services as well as ideas and technologies. Participation in the international economy was the primary source of growth in many East Asian countries that have experienced fast economic development during the past 50 years. This variable is measured as the ratio of imports (M) plus exports (X) to GDP [$(M + X) / GDP$]. Data Source: Penn World Tables (7.1).

ED-External Debt. External debt refers to credit owed to foreign lenders. The service of external debt may negatively influence growth by discouraging private investment. Clements et al. (2005) argue that larger debt service can inhibit growth by squeezing public resources available for investment. This variable is expressed as a ratio of GDP. Data Source: WDI (2011) Data Base.

EMPIRICAL ANALYSIS AND PRESENTATION OF RESULTS

Panel unit root tests

One of the econometric problems in empirical analysis is non-stationarity of time series data. Spurious regression and inconsistent results are likely to be obtained if we run a regression in the level form while the variables in the model are non-stationary and therefore inferences based on such data are likely to be meaningless. Due to this econometric problem, the variables in the models were tested for panel unit roots using the Levin-Lin-Chu (LLC) method. Levin-Lin-Chu test is based on the following hypotheses:

H_0 : Each time series contains a unit root.

H_1 : Each time series is stationary.

The results of the panel unit root tests for the variables are summarized and presented in Table 1.

Cointegration tests

The panel data property of each variable was established

Table 1. LLC Tests for stationarity/unit root tests for all variables (variables in levels).

Variable	LLC (Level)	LLC (first difference)	LLC (P-value) Level	Order of Integration
RGDPPG	-3.2612 -2.4582	-	0.0011	I(0)
GVTE	-1.8619 -1.7187	-4.1003 -2.9438	0.1783	I(1)
INV	-1.5662 -1.3780	-4.8588 -3.1609	0.5261	I(1)
OPNS	-1.4523 -1.3151	-5.1897 -3.2571	0.5978	I(1)
TOT	-1.1113 -1.0207	-4.2445 -2.9929	0.8646	I(1)
ED	-1.3853 -1.3642	-1.3845 -1.3629	0.6102	I(1)

Table 2. Hausman test results.

	(b) fixed	(B) random	(b-B) Difference	Std. Error
GVTE	-0.2265653	-0.2503636	0.0237983	0.0297179
INV	0.1515269	0.1442853	0.0072416	0.0468227
OPNS	-0.1484637	-0.1279882	-0.0204755	0.0142834
TOT	-0.0302839	-0.0352426	0.0049587	0.0034977
ED	-0.0536946	-0.0587427	0.0050481	0.004525

$$\chi^2 (5) = 14.02; \text{Prob} > \chi^2 = 0.0271.$$

and obtaining their order of integration, the next step was to establish whether the non-stationary variables are cointegrated. Usually, when variables are differenced to attain stationarity, the long-run properties are lost. Cointegration means that there is a long-run relationship between two or more non-stationary variables. Since the dependent variable (RGDPPG) was stationary (I (0)), it was not possible to check for cointegration in that particular case.

Hausman test

In order to decide whether to use random or fixed effects model, Hausman (1978) proposed a test for such a situation. Therefore, Hausman test is carried out and the null hypothesis is that the preferred model is random effects vs. the alternative fixed effects. It basically tests whether the errors are correlated with the regressors; the null hypothesis is that they are not. Hausman test looks at the difference in the coefficient estimates using fixed effects and random effects estimators. Hausman test was carried out and the results are presented in Table 2.

Test for cross-sectional dependence

Cross-sectional dependence is the interaction between cross-sectional units. Cross-sectional dependence leads to efficiency loss for least squares and invalidates conventional *t*-tests and *F*-tests which use standard variance-covariance estimators. The study employed the Breush-Pagan Lagrange Multiplier (LM) test of independence. The null hypothesis is that the residuals across entities are not correlated. The test results for cross-sectional dependence are presented in Table 3.

Heteroscedasticity Test

Heteroscedasticity is a situation where the error terms do not have constant variance. It can be caused by measurement errors and if there are sub-population differences or other interaction effects. Heteroscedasticity does not lead to biased parameter estimates; however, the standard errors are biased if heteroscedasticity is present. This in turn leads to bias in test statistics and confidence intervals.

Table 3. Results of economic growth and external debt regression.

Variable	Coefficient	Std. Error	t-Statistic	p-value
CONSTANT	1.4688	3.2897	4.011	0.0001
DED	-0.1416	0.0128	-3.47	0.0061
DGVTE	-0.0542	0.0926	-2.40	0.0175
DINV	0.4174	0.1069	3.90	0.0107
DOPNS	-0.2483	0.0119	-21.06	0.0000
DTOT	-0.0266	0.0108	-2.47	0.0143
Adj. R ² = 0.4042			Durbin Watson = 2.0697	
F (9, 195) = 4.2638			P-value (F) = 0.000046	
Breusch-Pagan LM test of independence	χ^2 (10) =	11.988		0.2859
Heteroscedasticity	χ^2 (5) =	520.14		0.0000
Wooldridge test for Panel Data	F (1, 4) =	0.631		0.4715

Dependent Variable: RGDPPG; Method: Fixed Effects Regression.

The test results for heteroscedasticity are presented in Table 3.

Test for serial correlation

Serial correlation occurs when the error terms from different time periods (or cross-section observations) are correlated. According to Drukker (2003), serial correlation in linear panel-data models biases the standard errors and causes the results to be less efficient; therefore, serial correlation should be identified in the idiosyncratic error term in a panel data model. A new test by Wooldridge (2002) is very attractive because it requires relatively few assumptions and is easy to implement.

A test for serial correlation was conducted and the results are presented in Table 3.

External debt and economic growth in the EAC

Most of EAC's public external debt remains on concessional terms, although its commercial component has increased in the recent past. The EAC's debt portfolio is mainly owed to multilateral creditors, mainly the World Bank's IDA and the African Development Bank followed by bilateral creditors which are essentially other countries for example Japan, Italy, Germany and commercial creditors. For example, in 2001, more than half of Kenya's long-term external debt was owed to the multilateral institutions, the largest amount due to the World Bank's IDA. Bilateral creditors are owed 35% of long-term debt with half of this proportion due to Japan. The external funds in EAC are mainly used to finance education and health expenditures, physical infrastructure and problems of drought and famine (AFRODAD, 2003).

The regression results in Table 3 show a statistically significant negative relationship (at 1 percent level of significance) between the government external debt ratio and the real GDP per-capita growth rate for the five EAC member countries included in the study. The results were as postulated and this means that, on average for the five EAC countries, a unit increase in government external debt leads to a 0.1416 decrease in economic growth, when other independent variables in the model are held constant. This implies that high levels of external debt are associated with low economic growth. The negative link between external debt and economic growth is due to the fact that larger external debt-service repayments can hinder growth by draining the public resources which could be used for development of infrastructure and human capital. Also external debt has strings attached and interest payments on the debt can reduce public savings by widening a country's budget deficit. Further, if interest rates rise, the credit available for private investment is crowded out, thereby depressing economic growth. These results are consistent with the findings of Clements et al. (2005), Pattillo et al. (2004) and Imbs and Ranciere (2009) but contrast the findings by Cordella et al. (2005) who found an insignificant debt-growth relationship at very low and high levels of debt.

The estimated results reveal that a unit expansion of government expenditure leads to a decline in economic growth by 0.0542 units in the EAC region and is statistically significant at 5 percent level. Expansion of government expenditure usually promotes economic growth if the public institutions are credible, but in countries where corruption is rampant like in the EAC, government resources are usually misappropriated and do not lead to meaningful development hence the negative coefficient of government expenditure. For example, according to the global corruption barometer

released by Transparency International in 2013, Kenya was ranked as the fourth most corrupt country in the world while Uganda stands at number 17. According to the East Africa Bribery Index (2010), in Kenya, for example, there are past corruption scandals where the tax payer lost a lot of money, for instance, the Goldenberg scandal in which US \$ 600 million was lost, misappropriation of free primary education funds to the tune of US \$ 1 million and the 2009 maize scandal cost the country about US \$ 26 million. The pattern clearly shows that corruption continues to prevail in critical public sectors of the economy, undermining the standards of living of the citizens thereby derailing development programmes and growth.

The negative effect of government expenditure on economic growth could also be as a result of the fact that in EAC, a greater volume of government spending is non-productive (like the recurrent expenditure in Kenya has surpassed the sustainable level) and the taxation associated with this reduces the rate of economic growth. This conforms to the findings of Barro (1996) who established that a big government is bad for growth. However, Cooray (2009) established that expansion of government expenditure contributes positively to economic growth if there is good governance.

The results confirm that investment drives economic growth of the EAC member countries. This means that an increase in the levels of investments by one unit would promote economic growth by 0.4174 units in the EAC region. Investment is one of the components of aggregate demand. If investment rises in an economy, aggregate demand will rise and therefore economic growth. Since the EAC countries have a lot of spare capacity, a rise in aggregate demand promotes growth. Infrastructural development is generally the engine of growth and especially in the LDCs where productivity is bigger for each unit of capital.

The coefficient of openness is negative and statistically significant at 1 percent level of significance. This implies that a unit increase in trade openness leads to 0.2483 units decrease in EAC countries' economic growth. These countries are net importers and their imports are majorly consumption in nature rather than investment oriented which is not good for growth. Increased imports also mean that consumers have shifted their demand from locally produced goods in favour of imported goods. This has affected local production in EAC especially in agricultural and industrial sectors thereby negatively impacting on economic growth. The results support studies by Adhikary (2011) who obtained a significant but diminishing negative effect of trade openness on economic growth of Bangladesh.

From the results, a unit change in terms of trade leads to a 0.0266 units decline in economic growth in the EAC. These results were as expected (negative relationship) since the region faces adverse terms of trade caused by the nature of the commodities they specialize in. Terms of trade volatility tends to induce volatility in consumer

spending, investment, inflation and economic growth thereby making macroeconomic policies difficult to implement. The EAC countries are developing and usually face sharp swings in export prices which contribute to increased volatility in growth of GDP. Studies by Mendoza (1997) and Broda (2004) have also concluded that changes in terms of trade can account for half of the output volatility in developing countries; furthermore the EAC member countries' exports are small and undiversified specifically the case of Rwanda and Burundi leading to weak growth performance. The EAC member countries like other developing countries are more sensitive to terms of trade volatility than their industrial counter parts that specialize in production of manufactured products. This is the reason why terms of trade are negatively related to economic growth in EAC.

The adjusted coefficient of determination ($Adj. R^2$) is 0.4042, meaning that 40.42 percent of the variations in RGDPPG are explained by the variables included in the model. For this model, the value of Durbin-Watson is 2.0697, close to 2, which reveals no serial correlation. The F value in this model is $F(9, 195) = 4.2638$, while the p-value (F) = 0.000046. This low p-value implies that all the regression parameters are simultaneously significantly different from zero and that the regression equation is valid in fitting the data.

The cross-sectional test dependence results in Table 3 reveal no cross-sectional dependence of the cross-sectional units since the p-value is greater than 0.05. The p-value of heteroscedasticity results is 0.0000; therefore the null hypothesis for homoscedasticity is rejected. The regression was done in the model by correcting for heteroscedasticity using the option 'robust' in fixed effects. The p-value of autocorrelation results is greater than 0.05, therefore, we accept the null hypothesis and conclude that the data do not have serial correlation.

CONCLUSION AND POLICY IMPLICATIONS

The main focus of this study was to establish the effect of external debt on the economic growth of the EAC member countries. Regression results of external debt and economic growth revealed that external debt expansion has a negative effect on economic growth of the EAC member countries. If properly utilised, external debt can help the developing countries like EAC to meet their development goals, but this has not been the case.

This study was based on the Debt-Augmented Solow model by Brauninger (2003). According to this model, capital and output grow (or decline) at the same constant rate. Capital and output growths are determined by the saving ratio, the deficit ratio and the government purchase ratio. An increase in the saving ratio leads to a rise in capital growth and output growth. An increase in the deficit ratio or in the government purchase ratio leads to a fall in capital growth and output growth. The reason for the negative effect of the deficit ratio on the growth

rate is that the budget deficit crowds out investment and thereby reduces capital formation. Therefore, the findings of this study conform to the theoretical debt-augmented Solow model.

The major objective of external debt in most developing countries like EAC is to boost economic activities and promote growth. Therefore, leakages in borrowed finances should be sealed. This could be supplemented through increased export earnings by export promotion strategy. Terms of trade can be improved through processing of the EAC exports. Openness should be enhanced for appropriate imports and ensure sustainable position on the balance of payment.

The governments should create a stable political environment in order to boost investors' confidence and increase investment levels and promote economic independence in these countries; this will help reduce the external debt burden.

Heavily indebted countries in the EAC need to adopt debt reduction strategies so that the large stock of external debt which negatively economic growth can be avoided. These countries can also use debt relief strategies such as debt rescheduling; reduced debt servicing, debt restructuring, debt buy backs and negotiate for write offs. Therefore, countries should remain within the internationally accepted debt ratio levels/bands (45 percent of the GDP). The findings further suggest that for each country in EAC, reducing public debt levels would contribute to growth by reducing the "crowding out" effect that debt has on investments.

From the results in Table 1, only the variable real GDP per capita growth rate (RGDPPG) was found to be stationary at 5 percent level of significance and therefore integrated of order zero (I (0)), while the rest of the variables, GVTE, INV, OPNS, TOT and ED are integrated of order one (I (1)). That is, they were found to be stationary after differencing them once.

Test: H_0 : difference in coefficients is not systematic

From the Hausman test results in Table 2, the p-value is 0.0271, less than 0.05. This shows that the value is significant and therefore fixed effects model is applicable in regression. The fixed effects model was therefore chosen for other models based on Hausman tests carried out.

The economic growth-external debt analysis was based on equation 3.1 which was estimated using panel fixed effects corrected for heteroscedasticity. The coefficient of the debt is interpreted by establishing how a unit increase in *ED* would lead to a specific unit change in RGDPPG. Regression of growth-external debt was carried out and results of the model are presented in Table 3.

Conflict of Interests

The authors have not declared any conflict of interests.

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