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The Determinants of East African Economic Growth

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Abstract

This paper focuses on examining the effect of government external debt on economic growth, investigating the effect of interest rate on economic growth, establishing the effect of government domestic debt on economic growth, and examining the effect of budget deficit on economic growth. The study was carried out for three East African countries, Kenya, Tanzania and Uganda, over the study period of 1980-2019. Autoregressive Distributed Lag (ADL) Panel Approach was used to specifically establish the effect of government external debt, interest rate, government domestic debt, and budget deficit on economic growth. Pooled Mean Estimator (PMG) was used to estimate both the general and full sample model. The results showed that in the long run, government external debt and interest rate had negative but not statistically significant effect on economic growth for the three countries. On the other hand, government domestic debt and budget deficit had positive effect but not statistically significant effect on economic growth. The results of the short term showed that government external debt, government domestic debt, and budget deficit had a negative but not statistically significant effect on economic growth for the three countries, while interest rate had a negative and statistically significant effect on economic growth for the three countries. Firstly, in order to achieve a positive economic growth, it is recommended that the East African countries, Kenya, Tanzania and Uganda, should design and implement debt, interest rates, and budget deficit policies to fit and align with

other macroeconomics policies. Secondly, they should restrain their expenditure to sustainable levels to maintain a balanced if not surplus budget. Thirdly, they should endeavor to put economic and legal framework in place to eradicate corruption of public funds. Fourthly, they should design and implement policies to broaden tax base to support a balance budget. Fifthly, the governments should avoid a crowding through huge borrowings in the domestic market at the expense of the private sector.

Keywords: Government debt, Interest rates, Fiscal policy, Economic growth

Introduction

Governments all over the globe often borrow to finance their budget deficits. Government indebtedness is the summation of both domestic and external debt (Akram, 2010). Government debt performs a crucial part in financing huge development infrastructure projects while bridging a country's fiscal deficit (Cecchetti, Mohanty & Zampolli, 2011). A huge level of government indebtedness has a risk associated with servicing default by the government by stating resource deficiency resulting to high interest rate levels (Siew & Yan, 2015). Fisher (1930) describes interest rate as the annual cost payable by the borrower to the lender in order to get a loan. Interest rate increase reduces the country's gross domestic product thereby slowing down the real sector growth (Udoka, Agwenjang & Tapang, 2012). An economic condition could be interpreted in relation to depression, recession, and boom (Pailwar, 2008). The main goals attributed to fiscal policy are re-allocation and re-distribution of possessions (Musgrave, 1959). Governments use fiscal policy to regulate the level of expenditure while enhancing stability in the economy (Tanzi, 2006; Perotti, 2007).

Government Debt

Government debt, as defined by Panizza and Andrea (2012), is the total amount of state's indebtedness in a nation. This is also known as state-owned debt. Akram (2010) categorizes government indebtedness as internal or foreign indebtedness. It is the credit borrowed by the government through different channels both within and outside the country. According to Martin (2009), government indebtedness is an approach used by states to finance their activities. Government indebtedness is a main measure that reflects the picture of the nation in the face of the global market (Abbas & Christensen, 2007). Government indebtedness, therefore, is the funds borrowed by any state, which can be categorized as external and internal debts.

Interest Rate

The rate of interest variation has deep effect on consumption and

savings behavior of households, accumulation of capital decisions of enterprises, and on the appropriation of both local and external merchants in the financial markets and exchange rates. It is often acknowledged that those adjustments influence the cumulative supply and demand environment in an economy that might appear instantaneously or for a two-year lag. These adjustments also impact the likelihood and arrangements of business agents about their ultimate future, as well as the altitude on the progress and reposition of earnings which pertains to the development of the economy (Keynes, 1936). In the event the interest, real rate is depressed compared to the price of accomplishing trade, thus investing and living becomes minimal. This triggers the economy since loans to buy cars and homes are cheap. Therefore, this results to the inclination of acquiring and consuming more. The interest rate also influences the levels of inflation, and the financial inflow of the economy is affected by the interest rate. Positive rate of interest determination (loaning more than the inflation rate) is seen as a necessity for favorable and tenable investment (Buckler, 1999).

Fiscal Policy

Government spending usage and rate of tax to influence the economy is known as the fiscal policy. Fiscal policy is mainly utilized by the state to advance sustainable and strong progress and to minimize poverty (Horton & El-Ganainy, 2009). State income and expenditure management required to control the economy is described by fiscal policy. By changing the position of expenditure and taxation income, the state may influence the outcome of the economy by decreasing or increasing economic activities (Weinstock, 2021). Thus, the usage of state expenditure to influence the economic action by deciding on the purchase of services and goods, the collection of taxes or the distribution of the transfer payment is regarded as fiscal policy (Hederson & Summers, 2005).

Economic Growth

Economic growth is a rise in the quality and quantity of economic services and goods that the society produces. It is a measure of the growth of individuals' real income. Nonetheless, the ration between the prices of what can be bought and individuals' income is on the rise. Also, poverty levels decrease as services and goods become more affordable (Roser, 2021). With the growth of the economy, government tax income is used to acquire the resources and develop the capacity required to dispense the communal services and goods that are produced by the society (Sen, 2021). Empirical and theoretical studies are not conclusive on the impact of government debt on the growth of the economy, and it is in this regard that this study covers the impact of government debt on economic growth in East

Africa countries. It was designed to address the following question: What is the impact of government debt, interest rates, and fiscal policy on economic growth of East Africa countries?

Objectives of the Study

The main objective of the study was to establish the impact of government debt, interest rates, and fiscal policy on economic growth in the three East Africa countries, while the specific objectives are:

- i. To examine the long-run effect of government external debt on economic growth in the three East Africa countries.
- ii. To investigate the long-run effect of government domestic debt on economic growth in the three East Africa countries.
- iii. To establish the long-run effect of interest rate on economic growth in the three East Africa countries.
- iv. To examine the long-run effect of budget deficit on economic growth in the three East Africa countries.
- v. To examine the short-term effect of government external debt on economic growth in the three East Africa countries.
- vi. To investigate the short-term effect of government domestic debt on economic growth in the three East Africa countries.
- vii. To establish the short-term effect of interest rate on economic growth in the three East Africa countries.
- viii. To examine the short-term effect of budget deficit on economic growth in the three East Africa countries.

Literature Review

Crowding Out Theory

The crowding out theory was first introduced by a British social researcher, Richard Titmuss, in 1970 in his book titled "The Gift Relationship". He proposed that external rewards might negatively influence action or participation. Buiters (1977), while examining the efficacy of fiscal policy and crowding out, noted that expanding government sector expenditure has the effect of diminishing expenditure in the business sector. The increase in government expenditure funded through tax reduces personal expenditure. If taxes are not increased by the government, the government is likely to acquire loans that are required to be paid with interest, thereby increasing the interest rate which further reduces the investment of an individual. In regard to this hypothesis, private ownership expenditure reduces as a result of state expenditure, which may not raise cumulative demand. As interest rates get bigger, the cost of borrowing can be afforded only by the state as the business sector is displaced from the market and as

government effectively takes a bigger share of current savings required for investment (Buiter, 1977).

Juessen, Linnermann and Schabert (2010) noted that the result of a huge public debt ratio is the inability of a nation to honor its debt obligation and has to default thereby causing financial anxiety in both foreign and internal market. A rise in public debt ratio is therefore perceived as an enlarged risk. Risk premium is thereby demanded by investors of exorbitant interest to make up for default risk. Internal investment is crowded out by huge interest rate as borrowing cost increases.

The Debt Overhang Theory

The valuation of a company in corporate finance and the impact of financing indebtedness were studied by Myers (1977), when he postulated the debt overhang theory. He examined the reasons as to why companies abstained from financing its enterprises with utmost borrowing, notwithstanding the reality that there is tax benefit since interest rates are deductive. He explained that huge quantity of borrowing or indebtedness makes it impossible for enterprises to create maximum anticipated funding resolutions. Indebtedness encourages behavior where projects which have a positive NPV are not initiated because part of prospective income from activities will go to lenders as agreed remittance (Myres, 1977).

Krugman (1988) advanced the possibility that forthcoming debt will outgrow the country's recovery capacity. Subsequently, expected cost of serving indebtedness will hinder further domestic and foreign venture since the earnings from profitable investment projects will be too little to expand the enterprise. This is because a big portion of economic development would be affiliated with the country providing the loan. The domestic and foreign funds will further be reduced, and this will curtail economic growth (Sachs, 1989; Krugman, 1988).

Keynesian Theory

Keynesian theory was put forward by John Maynard Keynes, a British economist of 1930's. He illustrated his hypothesis in the well-established theory of money, interest, and employment which was published in 1936. He stated that an increase in expenditure would increase demand. However, public expenditure is an important factor driving aggregate demand. He further argued that to maintain full employment, government spending was necessary and prolonged process of fiscal policy is required to elevate private investment due to recuperation of equilibrium in markets. In regard to the Keynesian models, increased public expenditure or tax cut can elevate total demand and enhance employment and total output. The aggregate rise in gross domestic product which is higher than the initial rise

in state expenditure of tax cut is initiated by the original rise in expenditure by the state or beneficiaries of taxes, which results in an array of income increase.

In line with the Keynesian model, Fatas and Mihov (2001) established that although rise in productivity is affected with a rise in individual expenditure, assets are essentially unaffected. They used recursive approach procedure and found that state expenditure multiplier was bigger than one. Blanchard and Perotti (2002) suggested dual phase approach to analyze shocks of fiscal policy. In phase one, corporate data in regard to transfer systems and tax, including their timings were used to separate the automated feedback of public spending and tax to trade cycles, thereby granting assessment of shocks of fiscal policy in phase two. They found that output is reinforced by government spending, real wages, and private consumption, which is consistent with Keynesian theory.

Loanable Funds Theory

Two economists, Dennis Robertson and Bertil Ohlin, a British and Sweden national, jointly formulated the theory of loanable funds in 1930s. Funds which are provided and accessible for loans to customers as well as investors within a time period are known as loanable funds. Here, interest rate theory is regulated by the synergy amid savers and borrowers. In regard to this theorem, financial agents are out to put the resources at their disposal to the best use within the existence of such funds. For private investors to enhance expected real earnings, they may contemplate financing now so as to gain benefits of the current accessible investment in the economy. This works solely in case the rate of investment's return surpasses the cost of borrowing (Ohlin & Robertson, 1937).

Saunders and Cornet (2011) noted that it is common for debtors to be reluctant to foot increased real interest rates than the available return on capital. Financiers are at all times ready to economize and loan as long as the current circumstances assure real income on the funds, which would permit them have greater consumption in time to come than otherwise they could do.

Government Debt and Economic Growth

Khan, Khanwar and Khan (2014) researched on the effect of a nation's borrowing on economic expansion, joblessness, and investment using OLS and simple regression models to analyze data. They established that public indebtedness was an impediment to economic growth, investment, and employment chance. They also noted that public debt diminishes the growth in investment and increases unemployment in Pakistan. Nevertheless, the economies of Pakistan and East Africa are different, and

the conclusion drawn is likely to differ if it was undertaken in a different economy.

Government Debt, Interest Rate, and Economic Growth

Gikandu (2008) examined the relation among Kenya's expansion of the economy and borrowings. Secondary data was obtained by the researcher on real growth in gross domestic product and real gross domestic product, statistics internal borrowing by instrument, and the total amount of internal debt. The period of study was twelve years for the financial years 1999/2000 to 2010/2011. To determine the existence of the relationship within the internal indebtedness and the expansion of Kenya's economy, Spearman's rank correlation was carried out. The investigation showed nonsignificant relation between internal indebtedness and the development of the economy. Adegbite, Ayadi and Ayadi (2008) researched on the effect of foreign indebtedness on economic development in Nigeria and South Africa and concluded that both countries had visible negative effect on debt and cost of servicing. Foreign debt had positive input to growth up to a certain level and, thereafter, it started decreasing. Using Granger causality test, Chowdhury (2004) performed a research on interrelatedness among government and private foreign debt, accumulation of capital, and manufacturing role and found that foreign indebtedness of countries that are developing is an indication instead of a justification of an economic slowdown.

Government Debt, Interest Rates, Fiscal Policy, and Economic Growth

Ayo et al. (2012) studied Nigeria's economic growth, inflation, and public spending from 1970-2009. The researchers used Vector Error Correction Model (VECM) and econometric model based on Johansen technique and ascertained that total expenditure has an unfavourable and insignificant impact on development rate. One way causation prevails among growth and government spending. Day and Yang (2010) examined the fiscal policy impact on development from 1930-2007 through the use of Keynesian growth model and found that long-term growth effects of expanding state expenditure or reducing taxation depends on the marginal propensity to invest and consume.

Consequently, Igwe, Emmanuel, and Uppere (2015) employed time series to examine the effect of fiscal policy in Nigeria on the development of the economy and found that explicit earnings taxation was oppositely linked and statistically significant in ascertaining the long-run economic development. In the long run, only tax determines the growth in the economy. Jilenga, Xu and Dacka (2016) applied ARDL Model to research on Tanzania's effect of foreign indebtedness on economic development and

found that foreign indebtedness appeared to be absolutely associated to economic development of the economy in the long term. On the other hand, external direct investment has a negative impact on economic development. Moreover, there was no directional short-term causality among the variables. M'Amanja and Morrissey (2005) used Autoregressive Distributed Lag (ADL) Model while researching on economic growth and fiscal policy in Kenya from 1964-2002. The result of their study showed that fruitful state spending has a negative but significant impact on growth while investments by the government are vital to growth. External support and government spending in Kenya was a study undertaken by Njeru (2003) using cointegration approach in which the results indicated that a favorable relationship exists between external aid and public expenditure.

Research Hypotheses

The key hypotheses that were tested include:

H₀₁: There is no statistically significant effect of government external debt on economic growth in the long run for the East Africa countries in the panel

H₀₂: There is no statistically significant effect of government domestic debt on economic growth in the long run for the East Africa countries in the panel

H₀₃: There is no statistically significant effect of interest rate on economic growth in the long run for the East Africa countries in the panel

H₀₄: There is no statistically significant effect of budget deficit on economic growth in the long run for the East Africa countries in the panel

H₀₅: There is no statistically significant effect of government external debt on economic growth in the short term for the East Africa countries in the panel

H₀₆: There is no statistically significant effect of government domestic debt on economic growth in the short term for the East Africa countries in the panel

H₀₇: There is no statistically significant short term effect of interest rate on economic growth in the East Africa countries in the panel

H₀₈: There is no statistically significant effect of budget deficit on economic growth in the short term for the East Africa countries in the panel

Research Design and Methodology

Research Philosophy

This study research used positivism because it is based on facts, causality, scientific laws, and testing of hypothesis. Creswell (2007) argues that the most appropriate research is one that is deterministic, based on priori assumptions, cause and effect oriented, and emphasizes on empirical data collection compared to a positivist research philosophy.

Research Design

This study adopted the causal and cross-sectional analytical design for several reasons. Firstly, the research design enables the determination of the cause and effects of the interrelationships between government debt, interest rates, fiscal policy, and the economic growth of Kenya, Uganda, and Tanzania. Secondly, the research design enhances the testing of hypothesis using analytical models where the relationships between variables are examined. Thirdly, the study used time series data that require analysis over a long-time period. Fourthly, the causal analytical design is appropriate since the effects on variables are tested. Zikmund (2002) postulated that determining the cause and effect relationship among variables is the main goal for undertaking causal research.

Data Collection

The study period was 1980 to 2019, while the population included Kenya, Uganda, and Tanzania economies where the universe of all variables was captured. This period covers the time before and after the liberalization of the countries' economies and, therefore, gave a better variation of the observations over the period.

Data Analysis

The study used a panel data based on the three East African countries, namely Kenya, Uganda and Tanzania, which covers the scope of the study. A panel H_01 , H_02 , H_03 , and H_04 data perspective facilitated a group comparative analysis to be carried out for a better understanding of policy formulation in the three countries concerning gross domestic product, debt level, interest rates, and fiscal policy decisions. The panel perspective took into account the dynamic changes due to repeated cross-sectional observations among the three countries (Lee & Wang, 2015). The study analyzed the data using STATA 13 statistical data econometric package which was comprehensive enough to analyze all the data.

Analytical Model

Data analysis involved using a combination of cross-section (N) and time series (T) for analysis.

Specification of the Models

The generalized ARDL (p, q, q, \dots, q) model is specified in Eqn 1 below;

$$y_{it} = \sum_{j=1}^p \delta_j y_{i,t-j} +$$

$$\sum_{j=0}^q \beta'_{ij} x_{i,t-j} + \varphi_i + e_{it}$$

where y_{it} is the dependent variable, (Gross Domestic Product-GDP), (x_{it}) is $k \times 1$ vector that are allowed to be purely I (0) or I (I) or cointegrated; δ_{ij} is the coefficient of the lagged dependent variable (GDP) called scalars; β_{ij} are $k \times 1$ coefficient vectors; φ_i is the unit specific fixed effects; $i=1 \dots, N$; $t=1, 2 \dots, T$; p, q are optimal lag orders; e_{it} is the error term. The p represents the lags for the dependent variable (GDP) and the q represents the lags for the regressors (Foreign Debt (FD), Domestic Debt (DD) Interest Rates (IR) and Budget Deficit (BD)) (Pesaran et al., 1997, 1999).

The re-parameterised ARDL ($p, q, q \dots q$) error correction model was specified as:

$$\Delta y_{it} = \theta_i [y_{i,t-1} - \lambda'_i x_{i,t}] + \sum_{j=1}^{p-1} \xi_{ij} \Delta y_{i,t-j} + \sum_{j=0}^{q-1} \beta'_{ij} \Delta x_{i,t-j} + \varphi_i + e_{it} \quad (\text{Eqn2})$$

Where:

$\theta_i = -(1 - \delta_i)$ group-specific speed of adjustment coefficient

(expected that $\theta_i < 0$)

λ'_i = vector of long-run relationship

ECT = $[y_{i,t-1} - \lambda'_i x_{i,t}]$, the error correction term

ξ_{ij}, β'_{ij} are the short-run dynamic coefficients

Descriptive Statistics

Descriptive statistics was done to explain the characteristic of gross domestic product, debt level, interest rates, and budget deficit (fiscal budget). This includes how they relate to each group to facilitate comparative analysis.

Correlation

The study tested and showed that the regressors do not have perfect or exact linear representations of one another (avoid multicollinearity).

Unit Root Test (URT)

The study shows that no variable is integrated in order two. Also, the study performed first and second generation URTs.

Optimal Lag Selection

Using the unrestricted model and an information criterion, the study had to decide the choice of lags for each unit/group per variable, and then choose the most common lag for each variable to represent the lags for the model.

Cointegration Test

The study performed Pedroni (1999, 2004) or Westerlund (2007) cointegration test but on assumption of long-run homogeneity. Cointegration was ascertained from the statistical significance of the long-run coefficients. Essentially, cointegration (or more generally a long-run relationship) presents itself as the joint significance of the levels equation.

Perform Hausman (1978) Test

The study tested the null hypothesis of homogeneity through Hausman-type test based on the comparison between the Mean Group (MG) and the Pooled Mean Group (PMG) estimators. Decision: Reject the null hypothesis if the prob-value < 0.05.

Estimation of the Model

From the outcome of the Hausman (1978) test, the model (s) is estimated. For instance, if the test favours the PMG estimator, the study shows the statistical significance of the long-run coefficients, the size of group-specific error adjustment coefficients, and the short-run coefficients. Thus, the results are interpreted accordingly (Bangake & Eggoh, 2012). The Mean Group (MG) estimate was proposed by Pesaran and Smith (1995). However, the mean group is less informative and averages the data (calculates the coefficients means). Subsequently, the mean group does not recognize the facts that certain parameters may be the same across groups. Dynamic Fixed Effect (DFE) estimator intercepts differ across groups. Under DEF, the slopes coefficients and error variances are identified. Dynamic Fixed Effect allows the dynamic specifications (e.g., the number of lags included to differ across groups).

Causality Tests

This was performed using Granger, Wald or weak exogeneity test. Causality can also be determined using the significance of the error correction term (for joint causality), long-run coefficients (for long-run causality), short-run coefficients (for short-run causality), ERC, and long- and short-run coefficients (for strong causality).

Diagnostic Test

Diagnostic test was performed not on the panel but group-specific so that the results can be compared.

Results

Descriptive Statistics

Table 4.1 on descriptive statistics below contain summary of the descriptive statistics of each of the natural log variables used for the panel data. The summary statistics mean, standard deviation, minimum, maximum variance, skewness, and kurtosis show and explain the characteristics of each variable in the model and how they relate to each sub-group to engage a comparative analysis. The important aspect to note is the variation in all the descriptive statistics of the variables shown in the table for the sample. Thus, the study explored the variations of the panel data in details.

Table 4.1. Descriptive Statistics

Variable	Gross Domestic Product	External Government Debt	Interest Rate	Government Domestic Debt	Budget Deficit
Mean	0.542634	22.47317	2.993441	18.24319	20.26163
Std. Dev.	1.095662	0.7431011	0.3089866	1.676855	1.466941
Min	-4.46527	20.35293	2.35928	14.74361	16.53467
Max	2.096559	24.25599	3.688879	22.44015	26.38198
Variance	1.200474	0.5521993	0.0954727	2.811842	2.151915
Skewness	-1.767739	-0.4769255	0.4069561	0.3700049	0.5802228
Kurtosis	7.020556	3.744115	2.424642	2.424826	5.404426
Obs	120	120	120	120	120

Correlation Statistics

Correlation statistics was carried out as shown in Table 4.2. Correlation test is important as it shows the level of perfect correlation linearity of the regressors and, therefore, avoids multicollinearity. An exact perfect collinearity or dependence of the regressors will constitute multicollinearity. Table 4.2 on correlation statistics indicates that none of the correlation coefficients are more than the absolute value of 0.8. Therefore, the panel sample data is free from multicollinearity problem of the regressors.

Table 4.2. Correlation

Variable	Gross Domestic Product	External Government Debt	Interest Rate	Government Domestic Debt	Budget Deficit
Gross Domestic Debt	1.000				
External Government debt	-0.0197	1.000			
Interest Rate	-0.2576	-0.1761	1.000		
Government Domestic Debt	0.2061	0.5885	-0.6168	1.000	
Budget Deficit	0.1108	0.6426	-0.4679	0.6264	1.000

Unit Root Statistics

The study carried out the unit root test using Im Pesaran-Shin, which assumes heterogenous slopes. Furthermore, the panel data sample exhibited a strongly balanced data for the three countries over the study period of 1980 to 2019. The objective of the URT was to ascertain that no variable understudy is integrated in order two. The study performed the unit root test using the 10% significance confidence level. The results of the unit root test are shown in Tables 4.3.

Table 4.3. Unit Root Test

Variable	Statistics	P-value	Stationery at level	Statistics	P-value	Stationary at first difference
Gross Domestic Debt	-4.6372	0.0000	Stationary	n/a	n/a	n/a
Government External Debt	2.5348	0.9944	Nonstationary	-4.9476	0.0000	Stationary
Interest Rate	-0.7129	0.2379	nonstationary	-4.5551	0.0000	Stationary
Government Domestic Debt	0.5873	0.7215	Nonstationary	-10.1897	0.0000	Stationary
Budget Deficit	-0.4062	0.3423	Nonstationary	-7.4144	0.0000	Stationary

Optimal Lags

Using the unrestricted model and information criterion, the study performed the choice of lag length for the model and variables for each

country. Thereafter, the most common lags were chosen for each variable to represent the lags for the model as shown in Table 4.4(a) and (b).

Table 4.4(a). Country Lags Summary

Variable	Gross Domestic Product	Government External Debt	Interest Rate	Government Domestic Debt	Budget Deficit
Country 1	1	1	0	1	1
Country 2	2	0	0	0	0
Country 3	1	0	0	0	1

Table 4.4(b). Model Optimal Lag Lengths Selection

Variable	Gross Domestic Product	External Government Debt	Interest Rate	Government Domestic Debt	Budget Deficit
Lags	1	0	0	0	1

According to the results, the lag for the countries for each variable is shown in Table 4.4(a). The model optimal lag length is selected by taking the common variable across the three countries as shown in Table 4.4(b).

Cointegration Test

Cointegration test was performed using the Pedroni (1999, 2004) test. Given the assumption of long-run homogeneity, this step could have as well been skipped since cointegration is ascertained from the statistical significance of the long-run coefficients and the error correction term. Essentially, cointegration (or more generally a long-run relationship) presents itself as the joint significance of the level's equation. However, the test was carried out to give a double assurance and confidence that the panel data exhibited cointegration among the variables in the model.

Table 4.5. Cointegration Test

Test Statistics	Panel	Group
V	1.175	-
Rho	-4.166	-3.813
T	-7.285	-8.26
Adf	-4.471	-5.186

All test statistics are distributed as $N(0,1)$, under a null of no cointegration, and diverge to negative infinity (save for panel v).

From Table 4.5, the cointegration test indicates seven statistics for both the panel and group (v, rho, t, and adf show the null hypothesis of no cointegration and only one is rejected, v cannot reject the null hypothesis of no cointegration at 1% confidence level).

Hausman (1978) Test

This test determined the most appropriate estimator, either PMG or MG, using the Hausman test. Under this test, the null hypothesis of homogeneity is observed through a Hausman-type test based on the comparison between the Mean Group (MG) and the Pooled Mean Group (PMG) estimators. The null hypothesis: PMG is the more efficient estimator. The decision: Reject the null hypothesis if the prob value < 0.05.

Based on the Hausman test outcome above, the decision criteria shows that if the probability value is greater than 0.05, the null hypothesis cannot be rejected. This implies that PMG is the more efficient estimator compared to MG estimator, given the probability value of $p= 0.9124$ as shown in Table 4.6. The study used the PMG to estimate the study model under the assumption of homogeneity of the group panel units.

The study also carried out the test to determine the most appropriate estimator, either PMG or DFE, using the Hausman test for robustness purpose of both estimators. Under this test, the null hypothesis of homogeneity is observed through a Hausman-type test based on the comparison between the Dynamic Fixed Effects (DFE) and the Pooled Mean Group (PMG) estimators. The null hypothesis: PMG is the more efficient estimator. The decision: Reject the null hypothesis if the prob value < 0.05.

Based on the Hausman test outcome above, the decision criteria shows that if the probability value is greater than $p= 0.05$, the null hypothesis is rejected. This implies that PMG is the more efficient estimator compared to DFE, given the probability value of $p= 0.0148$ as shown in Table 4.6. Although the group panel units are the same in the long run, the PMG estimator was used to analyze the model because its assumption of homogeneity aligns with the study assumption.

Table 4.6. Hausman Test

Estimator	P-value
PMG or MG	0.9124
PMG or DFE	0.0148

Estimation of Model

The PMG estimator was used to estimate the model under the general sample and the results are shown below on Table 4.7(a) Panel long run estimation and Table 4.7(b) Panel ECT and short-term estimation.

Table 4.7(a). Panel Long-Run Estimation

Variable	Co-efficient	z-statistics	P-value
Government External Debt	-0.2695232	-0.61	0.543
Interest Rate	-0.6846623	-0.88	0.380
Government Domestic Debt	0.276022	1.83	0.067
Budget Deficit	0.2736925	1.79	0.073

Panel Long-Term Model

$$\text{lngdp} = \text{Inexd} (-0.2695232) - \text{Inler} (0.6846623) + \text{Indmd} (0.276822) + \text{lnbdf} (0.2736925)$$

Table 4.7(b). Panel ECT and Short-Term Estimation

Variables	Co-efficient	z-statistics	P-value
Error Correction Term	-0.6706486	-0.544	0.000
Government External Debt	-1.739315	-1.63	0.103
Interest Rate	-2.724875	-4.78	0.000
Government Domestic Debt	-0.407907	-1.73	0.083
Budget Deficit	-0.1924935	-0.93	0.350
Constant	0.1689755	0.45	0.655

Panel Short-Term Model

$$\text{lngdp} = 0.1689755 - \text{Inexd} (1.739315) - \text{Inler} (2.724875) - \text{Indmd} (0.407907) - \text{lnbdf} (0.1924935)$$

Table 4.7(a) on Panel long run estimation shows the long run coefficients across the three countries that make up the panel under the assumption of homogeneity. Under PMG, the long-run coefficients are the same across the three countries that make up the panel. At 5% significant confidence level, increasing government external debt and interest rate by 1 percent had a negative of -0.2695232 and -0.6846623, respectively. However, this did not statistically have a significant long-run effect on economic growth at $p = 0.543$ and $p = 0.380$, respectively. On the other hand, increasing government domestic debt and budget deficit by 1 percent had a positive of 0.276022 and 0.2736925, respectively. Nonetheless, there was no statistically significant long-run effect on economic growth at $p = 0.067$ and $p = 0.073$ respectively for the three countries in the panel in the long run. These results are for the general sample in the long run.

Pooled Mean Group (PMG) estimator on Table 4.7(b) on Panel ECT and short-term estimation, the Error Correction Variance Term (ECT), and short-term coefficients are not the same for the three countries in the panel. Increasing government external debt, government domestic debt, and budget deficit by 1 percent had a negative of -1.739315, -0.407907, and -0.1924935, respectively. Nonetheless, there was no statistically significant short-term effect on economic growth at $p = 0.103$, $p = 0.083$, and $p = 0.350$, respectively. On the other hand, increasing interest rate by 1 percent had a negative of -2.724875 and a statistically significant short-term effect on economic growth at $p = 0.000$. The error correction term at 0.000 shows that a long-run cointegration exist among the variables at 5% confidence level in the panel.

Any deviation from the long run equilibrium was corrected at 67% adjustment speed. These results are for the general sample in the short- term.

The PMG estimator was used to estimate the model under the full sample and the results are shown below in Table 4.8(a), (b), (c), and (d) on ECT and short-term estimation for individual countries such as Kenya, Tanzania, and Uganda.

Table 4.8(a). Long-Run Estimation

Variable	Co-efficient	z-statistics	P-value
Government External Debt	-0.2695232	-0.61	0.543
Interest Rate	-0.6846623	-0.88	0.380
Government Domestic Debt	0.276022	1.83	0.067
Budget Deficit	0.2736925	1.79	0.073

Table 4.8(b). ECT and Short-Term Estimation (Kenya)

Variable	Co-efficient	z-statistics	P-value
Error Correction Term	-0.9040391	-5.83	0.000
Government External debt	-3.167881	-1.68	0.093
Interest Rate	-1.748308	-1.23	0.219
Government Domestic Debt	-0.2453421	-2.12	0.034
Budget Deficit	-0.5059156	-3.86	0.000
Constant	-0.322173	-0.05	0.958

Table 4.8(c). ECT and Short-Term Estimation (Tanzania)

Variable	Co-efficient	z-statistics	P-value
Error Correction Term	-0.4856309	-3.70	0.000
Government External Debt	0.3461485	0.37	0.713
Interest Rate	-2.702136	-1.84	0.066
Government Domestic Debt	-0.1065202	-0.55	0.584
Budget Deficit	0.196038	0.74	0.406
Constant	-0.0835459	-0.03	0.980

Table 4.8(d). ECT and Short-Term Estimation (Uganda)

Variable	Co-efficient	z-statistics	P-value
Error Correction Term	-0.6222759	-4.14	0.000
Government External Debt	-2.396212	-2.32	0.020
Interest Rate	-3.724181	-1.58	0.114

Government Domestic Debt	-0.8718588	-3.11	0.002
Budget Deficit	-0.2676028	-0.49	0.622
Constant	0.9126456	0.22	0.823

Table 4.8(a) on long-run estimation show the same results as that of the general sample under Table 4.7 (a) on long-run estimation. This is because the long-run coefficient is the same, i.e., homogenous for the three countries in the panel. However, the error correction term and short-term coefficients differ.

In Kenya, the results shown in Table 4.8(b) on ECT and short-term estimation indicate that increasing the four variables by 1 percent had a negative short-term effect on economic growth. Government external debt and interest rate had a negative effect of -3.167881 and -1.748308 respectively but were not statistically significant at $p=0.93$ and $p=0.219$. Nevertheless, government domestic debt and budget deficit had a negative short-term effect of -0.2453421 and -0.5059156 but were significant at $p=0.034$ and $p=0.000$ at 5% level, respectively. Kenya's error correction term shows that deviation from long run was corrected at 90% adjustment speed.

The results of Tanzania, shown in Table 4.8(c) on ECT and short-term estimation, indicate that increasing government external debt and budget fiscal deficit by 1 percent had a positive of 0.3461485 and 0.196038. However, there was no statistically significant effect at $p= 0.713$ and $p=0.460$ on economic growth respectively. On the other hand, an increase by 1 percent of interest rate and government domestic debt had a negative of -2.702136 and -0.1065202 short-term effect on economic growth but was not statistically significant at $p=0.066$ and $p=0.584$, respectively. Tanzania's error correction term shows that deviation from long run was corrected at 48% adjustment speed.

The results of Uganda, shown in Table 4.8(d) on ECT and short-term estimation, indicate that the four variables had a short-term negative effect of -2.396212, -3.724181, -0.8718588, and -0.2676028 for government external debt, interest rate, government domestic debt, and budget deficit respectively on economic growth. Government external debt and domestic debt had short-term effect on economic growth but were not statistically significant at $p=0.020$ and $p= 0.002$, respectively. Subsequently, interest rate and budget deficit had short-term effect on economic growth but were not statistically significant at $p=0.114$ and $p=0.622$, respectively. Uganda's error correction term shows that deviation from long run was corrected at 62% adjustment speed.

ECT can be negative (-1) but not lower than negative two (-2). The table shows that each country had different short-term coefficients or statistics

for the variables. This is because the assumption of PMG outlines that only long-term coefficients are the same for the three countries that make up the panel. None of the three countries had a positive error correction term, which implies no cointegration to long-run equilibrium. Also, the model in question is explosive. Given that the three countries are heterogeneous, there is a common element which supports the assumption of homogeneity plausible.

Causality Test

While causality test can be carried out using Granger, Wald or Weak Exogeneity test, the study determined the causality test using the significance of error correction term (for joint causality), long-run Coefficients (for long-run causality), short-term coefficients (for short-term causality), ECT, and long- and short-term coefficients (for strong causality). According to Table 4.7(a) on long-run estimation of the general sample results, the interpretation of causality for the variables in the estimated model is as follows.

Long-Run Causality for the Panel Model

Based on the PMG results in Table 4.7(a) on long-run estimation, external debt, interest rate, domestic debt, and budget fiscal deficit had no long-run causal effect on economic growth at 1% significance level. The long-run causal effect as inferred from the general sample results for the panel is shown in Table 4.9. Short term causality for panel model is also identified. Based on Table 4.7(b) on ECT and short-term estimation, interest rate had a short-term causal effect on economic growth at 1% significance level. On the other hand, government external debt, government domestic debt, and budget fiscal deficit had no short-term causal effect on economic growth.

Joint Causality for Panel Model

Based on Table 4.7(a) on long-run estimation, all the variables had causal effect on economic growth in the long run as the error correction term shows long-run cointegration. There was long-run convergence equilibrium at the speed of 67%. The error correction term indicates a causal joint effect. Table 4.8(b), (c), and (d) shows the full sample results of the PMG estimator model. The causality test is determined from coefficients of each of the three countries in the panel as follows.

Long-run Causality for Each Country

The result interpretation is shown in Table 4.9. However, Table 4.7(a) is the same as for the general sample of Table 4.8(a).

Short-term Causality for Each Country Model

As shown in Table 4.8(b) on ECT short-term estimation for Kenya, government domestic debt and budget deficit had a short-term causal effect on economic growth at 1% confidence level. Subsequently, government external

debt and interest rates had no short-term causal effect on economic growth. As shown in Table 4.8(c) on ECT short term estimation for Tanzania, government external debt, interest rate, government domestic debt and budget deficit had no short-term causal effect on economic growth. As shown in Table 4.8(d) on ECT short term estimation for Uganda, government external debt and government domestic debt had short-term causal effect on economic growth, while interest rate and budget deficit had no short-term causal effect on economic growth.

Joint Causality for Each Country Model

All the variables had causal effect on economic growth in the long run as the error correction term show cointegration for each of the three countries. There was long-run convergence equilibrium at 90%, 48%, and 62% adjustment speed for Kenya, Tanzania, and Uganda, respectively. The error correction term for each of the three countries indicate a causal joint effect.

Diagnostic Test

Since it is not possible to conduct diagnostic test on the panel model, the test was conducted on the ARDL Time Series of the individual countries in the panel. This allowed a robust comparison of the diagnostic results in the three countries. The diagnostic tests included serial correlation, heteroskedasticity, and stability of the models.

The Kenya, Tanzania, and Uganda serial correlation tests based on Null Hypothesis of no serial correlation were undertaken. Based on the results below, the null hypothesis cannot be rejected. The model does not suffer from serial correlation as confirmed by Durbin Watson and Breusch-Godfrey test results. Thus, the model was stable as shown by Cusum squared test results with the model line within the boundaries at 5% significance.

Table 4.9. Diagnostic Test

Diagnostic Test	Serial Correlation	Serial Correlation	Heteroskedasticity	Stability
Country	Durbin Watson Test	Breusch Godfrey Test	White Test	Cusum Squared Test
Kenya	1.896212	P = 0.2464	P =0.2341	Stable
Tanzania	2.779297	P = 0.0017	P = 0.7386	Stable
Uganda	2.100829	P = 0.0809	P = 0.7033	Stable

Hypotheses Testing

This study used the ARDL Panel Approach to determine the long-run and short-term effect of the four variables on economic growth for the three countries in the panel.

H₀₁: There is no statistically significant effect of government external debt on economic growth in the long run for the East Africa countries in the panel.

This hypothesis was tested with the government debt which was split into government external and government domestic debt. Specifically, the results show that increasing government external debt by 1 percent had a negative (-0.2695232 percent) but not statistically significant effect at 5% ($p=0.543$) on economic growth in the long run. The results confirm the hypothesis that external debt has no statistically significant effect on economic growth in the long run for the East African Countries in the panel, even though the effect is negative over the study period of 1980-2019.

H₀₂: There is no statistically significant effect of government domestic debt on economic growth in the long run for the East Africa countries in the panel.

Under the Pool Mean Group (PMG) estimator, general sample results showed that increasing domestic debt by 1 percent had a positive (0.276022 percent) but not statistically significant effect at 5% ($p=0.067$) on economic growth in the long run. The results confirm the hypothesis that domestic debt has no statistically significant effect on economic growth in the long run for the East African Countries in the panel, even though the effect is positive over the study period of 1980-2019.

H₀₃: There is no statistically significant effect of interest rate on economic growth in the long run for the East Africa countries in the panel.

Under the Pool Mean Group estimator, general sample results long-run estimation indicate that increasing interest rate by 1 percent had a negative (-0.6846623 percent) but not statistically significant effect at 5% ($p=0.380$) on economic growth in the long run for the three countries in the panel over the period of 1980-2019. The results confirm the hypothesis that interest rate has no statistically significant effect on economic growth in the long run for the three East African Countries in the panel, even though the effect is negative over the study period of 1980-2019..

H₀₄: There is no statistically significant effect of budget deficit on economic growth in the long run for the East Africa countries in the panel.

Under the Pool Mean Group estimator, general sample results long-run estimation indicate that increasing budget deficit by 1 percent had a positive (0.2736925 percent) but not statistically significant effect at 5% ($p=0.073$) on economic growth in the long run for the three countries in the panel. The findings confirm the hypothesis that budget deficit has no statistically

significant effect on economic growth in the long run for the three East African countries in the panel, even though the effect is positive over the study period of 1980-2019.

Table 5.1(a). Summary Results of Panel (Long-Run Effect)

Study Objectives	Hypothesis	Variables	Coefficient	p-value Results	Interpretation of Statistical Significance level at 5%
Investigate effect of government external debt on economic growth in the long run	Government external debt has no significant effect on economic growth in the long run (HO=0)	Government external debt	-0.2695232	P=0.543	Not Statistically Significant
Investigate effect of interest rate on economic growth in the long run	Interest rate has no significant effect on economic growth in the long run (HO=0)	Interest rate	-0.6846623	P=0.380	Not Statistically Significant
Investigate effect of government domestic debt on economic growth in the long run	Government domestic debt has no significant effect on economic growth in the long run (HO=0)	Government domestic debt	0.276022	P=0.067	Not Statistically Significant
Investigate effect of budget deficit on economic growth in the long run	Budget deficit has no significant effect on economic growth in the long run (HO=0)	Budget deficit	0.2736925	P=0.073	Not Statistically Significant

H₀₅: There is no statistically significant effect of government external debt on economic growth in the short term for the East Africa countries in the panel.

Pooled Mean Group (PMG) estimator under the short-term assumes that the error correction variance term (ECT) and short-term coefficients are not the same for the three East African countries in the panel. Therefore, the results show that in the short term, increasing government external debt by 1 percent had a negative (-1.739315 percent) but not statistically significant effect at 5% (p= 0.103) on economic growth in the short term over the study period of 1980-2019.

H₀₆: There is no statistically significant effect of government domestic debt on economic growth in the short term for the East Africa countries in the panel.

Under the Pool Mean Group estimator, general sample results in the short-term estimation show that increasing government domestic debt by 1

percent had a negative (-0.407907 percent) but not statistically significant effect at 5% ($p= 0.083$) in the short term over the study period of 1980-2019.

H₀₇: There is no statistically significant effect of interest rate on economic growth in the short term for the East Africa countries in the panel.

Under the Pool Mean Group estimator, general sample results in the short-term estimation show that increasing interest rate by 1 percent had a negative (-2.724875 percent) and statistically significant effect at 5% ($p= 0.000$) on economic growth in the short term over the study period of 1980-2019.

H₀₈: There is no statistically significant effect of budget deficit on economic growth in the short term for the East Africa countries in the panel.

Under the Pool Mean Group estimator, general sample results in the short-term estimation show that increasing budget deficit by 1 percent had a negative (-0.1924935 percent) but not statistically significant effect at 5% ($p=0.350$) on economic growth in the short term over the study period of 1980-2019.

Table 5.1(b). Summary Results of Panel (Short-Run Effect)

Study Objectives	Hypothesis	Variables	Coefficient	P-value	Interpretation of Statistical Significance level at 5%
Investigate effect of government external debt on economic growth in the short run	Government external debt has no significant effect on economic growth in the short run ($H_0=0$)	Government external debt	-1.739315	$P=0.103$	Not Statistically Significant
Investigate effect of interest rate on economic growth in the short run	Interest rate has no significant effect on economic growth in the short run ($H_0=0$)	Interest rate	-2.724875	$P=0.000$	Statistically Significant
Investigate effect of government domestic debt on economic growth in the short run	Government domestic debt has no significant effect on economic growth in the short run ($H_0=0$)	Government domestic debt	-0.407907	$P=0.083$	Not Statistically Significant
Investigate effect of budget fiscal deficit on economic growth in the short run	Budget deficit has no significant effect on economic growth in the short run ($H_0=0$)	Budget deficit	-0.1924935	$P=0.350$	Not Statistically Significant

Discussion of Findings

Effect of Government External Debt on Economic Growth (H_{01} and H_{05})

The effect of government external debt on economic growth in the long-run and short-term (H_{01} and H_{05}) findings concur with the study findings by Were (2001), who investigated the effect of foreign indebtedness on the growth of Kenyan economy. It was found that foreign indebtedness accumulation has an adverse effect on the growth of the economy and private assets. The results also concur with the study findings of Umary, Aminu, and Musa (2013) on foreign debt and internal debt impact on the growth of Nigeria's economy. They found that foreign debt exhibited unfavorable impact on the growth of the Nigeria's economy. The results further support the findings by Kharusi and Ada (2018) that foreign debt had adverse impact on the growth of the Oman economy. The results provide evidence in support of the findings by Adegbite, Ayadi, and Ayadi (2008) which show the negative impact of external debt on the development of the economies of South Africa and Nigeria.

Effect of Government Domestic Debt on Economic Growth (H_{02} and H_{06})

The effect of government domestic debt on economic growth in the long-run and short-term (H_{02} and H_{06}) results concur in the long run but not in the short term based on the findings of Umary, Aminu and Musa (2013). They found that internal debt had a favourable effect on the economic growth of Nigeria. In the short term, the current study findings results indicated a negative effect of government domestic debt on economic growth, which is contrary to the study by Umary, Aminu, and Musa (2013).

Effect of Interest Rate on Economic Growth (H_{03} and H_{07})

The effect of interest rate on economic growth in the long-run and short-term (H_{03} and H_{07}) findings is contrary to the findings of Sambiri et al. (2014). They found that interest rates had a positive and significant effect on economic growth. The study findings deviate from the findings of Sergey et al. (2017), which show that interest rates were efficient and had a positive effect on the Russian economic growth after the financial crisis. However, in the short term, the current study finding results indicated a significant effect of interest rate on economic growth. This concurs with the study findings of Sambiri et al. (2014) that interest rate were efficient.

Effect of Budget Deficit on Economic Growth (H_{04} and H_{08})

The effect of budget deficit on economic growth is indicated in the long run and short-term (H_{04} and H_{08}). The long run findings of the positive effects of budget deficit on economic growth contradict the findings by Kaakunga (2006), which reveal that budget fiscal deficit is inversely related

to the rate of economic growth in Namibia. However, in the short term, the current study findings of the negative effect of budget deficit on economic growth concur with the study findings of Kaakunga (2006).

Conclusion

The results obtained from the estimation of the general sample panel of the Pooled Mean Group estimator model showed that government external debt and interest rate had a negative effect on economic growth over the long run. Conversely, government domestic debt and budget deficit had a positive effect on economic growth across the three countries in the panel. In the short term under the general sample panel, the four variables had negative effect on economic growth across the three countries in the panel.

On the other hand, results obtained from the estimation of the full sample of the Pooled Mean Group estimator model indicated that interest rate and government domestic debt had negative effect on economic growth for each of the countries separately in the panel, while there were variations and mixed effect of government external debt and budget deficit on economic growth in the short term among Kenya, Tanzania, and Uganda.

Specifically, under the full sample of the Pooled Mean Group estimator, the four variables in Kenya were not desirable for economic growth with government external debt having the most negative effect on economic growth. In Tanzania, government external debt and budget deficit had favorable and positive effect on economic growth, while interest rate and government domestic debt had negative effect on economic growth. In Tanzania, interest rate had the most negative effect on economic growth. In Uganda, the four variables had negative effect on economic growth and interest rate had the most negative effect on economic growth.

In general, it may be concluded from the general sample panel results that fundamental long-run policy decisions effects of government external debt, interest rate, government domestic debt, and budget deficit on economic growth are homogenous in the long run across the three countries. On the other hand, heterogenous short-term policy decisions of the four variables affect the economic growth across the three countries differently. The same observation and conclusion can be drawn from the full sample results where the heterogenous short-term policy decisions of the four variables affect the economic growth among the three countries differently.

The results in the general sample panel satisfactorily explain the long-run inverse relationship between debt and economic growth, thus supporting the neoclassical proposition. As regards the effect of debt on the economic growth, the results of the general sample panel further confirm the presence of crowding out phenomenon and debt overhang effects.

Implications

This research is of great importance to the governments of the East Africa countries as the results may be used to make both short-term and long-term policy interventions required in government borrowing while also enhancing economic stability. It is also of value to government practice of borrowing as its findings inform the government on whether the debt is hurting the economy or not. Therefore, the government will be able to take appropriate measures and adhere to the best practices. It also contributes to the practice in public finance mainly regarding government borrowing, interest rates, fiscal policy, and economic growth. Finance practitioners will find this study insightful on the aspect of the extent to which government debt, interest rates, and fiscal policy affect the growth of the economy of East Africa countries.

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