

Government Capital Expenditure and Economic Growth: An Empirical Investigation

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Author's contribution

The sole author designed, analyzed, interpreted and prepared the manuscript.

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ABSTRACT

The purpose of this study was to investigate how capital government expenditure contributes to economic growth in East African countries. Many past empirical studies on the relationship between public capital spending and output growth show inconsistent results and mainly focus on total public expenditure. Hence, this study aims to determine the impact of public capital spending on economic growth using panel data series for East African countries. The secondary data sources were statistical abstracts and World Bank reports. To check if the variables have a relationship, this study used the panel least squares (OLS) estimation technique. The results showed that capital spending has a positive and significant effect on economic growth in East Africa. This research suggests that in East African economies, the strategy and policy of increasing government spending on the capital budget to promote economic growth will be appropriate, but fewer funds should be channeled towards recurrent programs.

Keywords: Capital expenditure; economic growth; public finance; macro economy.

JEL Classification: E62, H54;

1. INTRODUCTION

The link between public capital expenditure and economic growth has continued to generate a series of debates. While some economic scholar concludes that the effect of capital expenditure on economic growth is positive [1] [2] through an increase in productivity, others indicate that the effect is negative [3] [4] through the crowding out effect. This source of fiscal policy promotes economic growth in the sense that public investment contributes to capital accumulation [5]. Other importance of public expenditure includes the provision of those facilities that are not fully covered by the market economy such as health and education. That is, human capital which helps in promoting positive benefits associated with economic growth, but the financial source for public expenditure is taxation; it reduces the benefits of the taxpayers and as such diminishes the advantage linked to output accumulation [6].

The beneficial side of government spending includes the use of fiscal policies like income taxes and transfer payments which can lead to more equitable redistribution of income; The supply of pure public goods which may constitute a sizeable component of aggregate demand; Government often acts as a facilitator in the markets with asymmetric and imperfect information [7] [8]. Increased government spending may also slow economic growth. This is possible as a result of competition between the less efficient public sector and the private sector in the credit market which may increase interest rate thereby misallocating private investment and eventually reducing output growth [8] Kenya, Uganda, and Tanzania are not an exception.

According to the Keynesian school of thought, government expenditure can contribute positively to economic growth. Hence, an increase in government consumption is likely to lead to an increase in employment, profitability, and investment through multiplier effects on aggregate demand. As a result, government spending augments the aggregate demand, which provokes an increased output depending on the expenditure multiplier [7]. The opponents of this approach stipulate that government consumption crowds out private investment, discourage economic growth in the short run, and diminish capital accumulation in the long run [5].

The East African Community (EAC) members (Kenya, Uganda, and Tanzania) nonetheless

remain diverse in terms of incomes, industrial structures, and social indicators. In East Africa, capital spending budgets have been experiencing an increasing trend. But due to lack of sufficient revenue, there is a need to categorize productive and non-productive government expenditure for East Africa in order to reduce the non-productive expenditure.

1.1 Statement of the Problem

The steady rise of government expenditure for many years, in most countries, demonstrates a growth link between fiscal policy tools and growth [3]. However, most sub-Saharan countries face heavy debt burden, high rate of inflation, budget deficit, and balance of payment deficit. This may be attributed to poor domestic policies and external shocks. However, the main problem is argued to be the ever-increasing public expenditure. This higher spending undermines economic growth by transferring scarce resources from the productive sector of the economy to less productive sectors, which use them less efficiently. This research, therefore, adopts the question as to whether or not capital expenditure has contributed to economic growth in East Africa.

1.2 Objective

The main objective of the study is to determine the impact of government capital expenditure on the economic growth of East African countries.

2. LITERATURE REVIEW

A Keynesian hypothesis leads to the conclusion that aggregate demand management policies can and should be used to improve economic performance. For Keynesians demand is a prerequisite for growth. According to the Harrod-Domar model, to determine an equilibrium growth rate (g) in the economy, the balance between supply and demand for a nation's output should be maintained [7]. On the supply side, saving is a function of the level of GDP (Y), say $S=sY$. The level of capital K needed to produce an output Y is given by the equation $K=rY$ where r is called capital-output ratio. Investment (I) implies an increase in capital stock or demand side (Thus, $\Delta K=r\Delta Y = I$). Therefore, the equilibrium rate of growth (g) is given by $g = \Delta Y/Y = s/r$. This shows how an economy can change if capital capacity is equal to the demand of output.

Solow [9] identified the Size of physical capital as the source of growth differentials between nations. The model assumes that technology will always grow at a constant rate. This implies that poor countries with the lower value of capital and output grow faster than rich ones and consequently the former tend to catch up with the latter. In the Solow neoclassical growth model, if an expansionary fiscal policy is maintained, then the long-term consequences may be a lower level of steady-state GDP. This is because the government-via a budget deficit-drives a wedge between private saving and investment. The reason is that government absorbs part of private savings to finance the deficit.

2.1 Limitations of Previous Empirical Studies

In the East Africa case, there have been few recent econometric studies regarding the effect of different government spending components on economic growth. But most of them have been country-specific and used time series methods [1] hence this research focuses specifically on East Africa as a whole and employed panel data. As a result of the above-mentioned factors, the researcher found it necessary to devolve into the study to fill the existing research gap.

2.2 Conceptual Framework

The study postulates that capital expenditure and selected macroeconomics variables explain economic growth in 3 East Africa countries. In between the dependent and explanatory variables are the intervening variables that are

3.2 Econometric Procedure

In this study, an econometric model formulated from Ram [10] and developed further by Lin [11], Kweka and Morrissey [12], and Gisore [13] was used for this econometric analysis. Building on Lin [14], a simple growth model is adopted. Therefore, the regression equation was specified as:

$$\ln Y_{i,t} = \beta \ln X_{i,t-1} + \gamma \ln G_{i,t-1} + \mu_i + v_t + \varepsilon_{i,t} \quad (1)$$

Where, $\ln Y_{i,t}$ - the dependent variable – real economic growth
 $\ln X_{i,t-1}$ - set of explanatory variables apart from capital expenditure
 $\ln G_{i,t-1}$ – the government capital expenditure variables
 β and γ - are parameters to be estimated
 μ_i – county fixed effects v_t – time fixed effects $\varepsilon_{i,t}$ – the error term
 and the subscripts i and t represent county and time period respectively.

T

hus, panel model to be estimated is specified in logarithm form as:

not controlled. These macroeconomic determinants of economic growth are conceptualized in Fig. 1.

3. METHODOLOGY

3.1 Research Design

The study employed a quantitative research design so as to capture the trend and impact of government capital spending on East Africa's growth. This was carried out in the period 1985-2015 using secondary data sources and the ordinary least squares (OLS) estimation method. East Africa is found within the continent of Africa in the Sub Saharan region. East Africa comprises Tanzania, Uganda, and Kenya is located between 5030"N 120S and 28045"E 41050" E. The three countries are members of East African community integration. The East African Community (EAC) is focused on widening and deepening the integration process among the five Partner States. The consolidation on the Customs Union and smooth running of a Common Market and Monetary Union will invariably rely on the availability of accurate, reliable, timely, and comparable data for planning, monitoring, and evaluation purposes. Equally, the successful adoption and implementation of the EAC Protocol place a high premium on close and effective monitoring of macroeconomic performance. Hence this study will provide important information on the influence of one key macroeconomic variable the public spending. Fig. 2. represents the map for EAC.

$$y = f(g, r, h, a, t, p, o)$$

$$\ln y_{i,t} = \beta_0 + \beta_1 \ln g_{i,t} + \beta_2 \ln r_{i,t} + \beta_3 \ln h_{i,t} + \beta_4 \ln a_{i,t} + \beta_5 \ln t_{i,t} + \beta_6 \ln p_{i,t} + \beta_7 \ln o_{i,t} + \epsilon_{i,t} \quad (2)$$

Where, $\ln y_{i,t}$ - economic growth (Real per capita GDP growth),

$\ln c_{i,t}$ - Government capital expenditure,

$\ln r_{i,t}$ - Government recurrent expenditure,

$\ln h_{i,t}$ - Government human capital expenditure,

$\ln a_{i,t}$ - Government total expenditure,

$\ln o_{i,t}$ - Trade Openness,

$\ln t_{i,t}$ - Terms of Trade,

$\ln p_{i,t}$ - Population growth.

3.3 Justification of the Variables and Sources of Data

The study used data from East African countries, which were selected mainly based on the availability of data for the period under consideration. The data covered the period between 1985 and 2015. Consequently the variables were expressed in annual changes for a total of 93 observations on each variable. The data was collected from the World Bank reports and Statistical abstracts.

It was expected that the capital expenditure and human capital would have a positive sign, implying that they are productive expenditures. Public spending on capital goods is supposed to add a country's physical capital which, in turn, could complement private sector productivity and increase growth in the process. The accumulation of human capital increases returns to the capital stock and makes growth more sustainable [13]. But recurrent and total expenditures were expected to give a negative result since most recurrent expenditures crowd out private investment. Openness and terms of trade were expected to have a positive effect on GDP growth because open economies can have more access to foreign resources and markets [14]. Population growth was also expected to retard economic growth especially in developing economies as a result of the increased dependence ratio.

3.4 Econometric Data Analysis

Descriptive and inferential analyses were used to analyze the panel data, all to investigate the link between capital expenditure and economic growth in East Africa. The Panel data were estimated using the ordinary least squares (OLS) panel estimation technique, geared at controlling

for time-invariant and unobservable country effects.

The Hausman [15] test was applied to underpin the application of the fixed or random-effects model in this analysis. Fixed-effects (FE) are used whenever one is only interested in analyzing the effect of variables that vary over time. However, the Random effects (RE) model assumes that the entity's error term is not correlated with the predictors which allows for time-invariant variables to play a role as explanatory variables. The equation for the fixed effects model can be expressed as:

$$Y_{i,t} = \beta X_{i,t} + \alpha_i + \mu_{it}$$

Where

α_i ($i = 1, \dots, n$) is the unknown intercept for each entity (n entity-specific intercepts).

Y_{it} is the dependent element.

X_{it} represents one independent variable (IV),

β_1 is the coefficient for that IV,

u_{it} is the error term

Macroeconomic time series data are generally characterized by a stochastic trend which can be removed by differencing. If a variable contains a unit root, then it is non-stationary and if not, then it is stationary. This study adopted Levin-Lin-Chu's [16] technique to verify the presence of unit root. Following Engel and Granger co-integration approach, the study attempted to determine whether a long-run relationship exists between the variables.

Post-estimation panel diagnostic tests were carried out during the study. Heteroskedasticity, serial correlation, and contemporaneous correlation were tested for the above models before estimation and corrected accordingly.

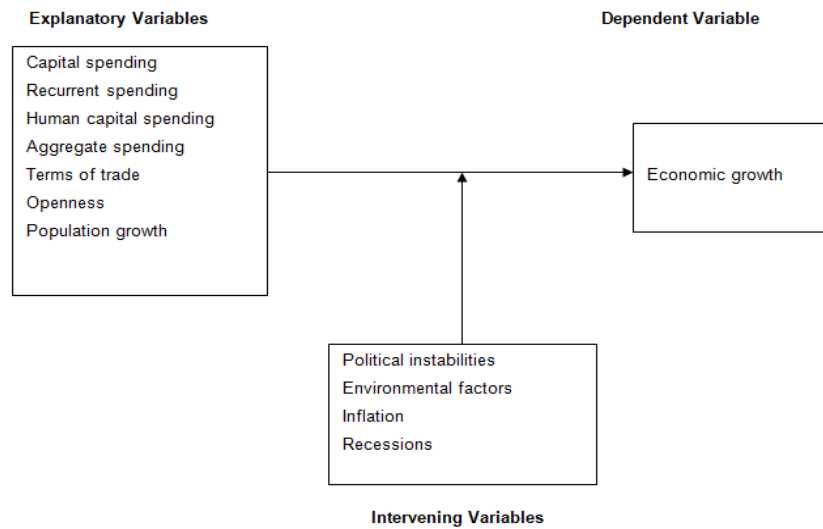


Fig. 1. Conceptual framework
Source: Gisore, 2017

4. RESULTS AND DISCUSSIONS

4.1 Correlation Matrix Results

Bivariate correlation was applied to evaluate the degree of relationship between capital expenditure and economic growth. The study used Pearson Correlation (r), the most commonly used bivariate correlation technique, to estimate the relationship. From the result, capital, total and human capital expenditure had a positive correlation with real GDP growth. Implying capital and human capital spending explains the growth in East Africa through capital accumulation. Furthermore, the correlation matrix results indicate that terms of trade, population, and openness had a negative correlation with economic growth. Implying the preceding factors may slow economic growth.

4.2 Panel Unit Root Test Results

As earlier discussed, Levin-Lin-Chu's [16] method was conducted at the level and the first difference and the result are reported in Table 1. The findings reveal that all the study elements are non-stationary at a level except economic growth and capital spending. However, they become stationary after the first difference implying that the variables are integrated of order one, $I(1)$.

Estimation of co-integrating relationship requires that all-time series variables in the model to be

integrated order of one. But from the results in Table 1, the dependant variable economic growth is already stationary $I(0)$ while the rest of the variables are of order (1), hence they are not of the same integration. This meant co-integration is negative.

4.3 Panel Estimation Results

The study adopted the OLS estimation method and complemented it by the fixed effect model as chosen by the Hausman test result (p-value is 0.03). Table 2 presents the results of the fixed effect estimation model.

From the findings in Table 2, the impact of capital spending on East African GDP growth is significantly positive at 5 percent. Thus, the null hypothesis is rejected at a five percent level of significance. This means that if capital spending increase by one percent consequently economic growth will increase by about 0.49 percent. This public investment, as argued in growth models, is necessary to increase productivity and output, and to gear up the economy for take-off into the middle stages of economic development [17] [13]. Government investment in essential infrastructure is a precondition for capital accumulation in the private sector growth and an additional input in private sector capital build-up [18] [17] [19] Gemmell's [17] and Niloy *et al.*'s [20] research showed that the share of government capital expenditure in GDP is positively and significantly correlated with

economic growth. In contrast, Kweka and Morrissey [12] found the relationship between capital expenditure and growth for Tanzania to be negative.

From the regression results, the coefficient of human capital is insignificant in East Africa. The insignificant result is probably because effects from the education sector would have very long lags [21]. The above results point out that recurrent expenditure has a negative and statistically significant effect on growth. As explained by Romer [7] and Lin [11] recurrent

spending is likely to crowd-out private investment. In other results, total expenditure is positive and significant to growth as a result of aggregate demand effects [4]. Further, population growth was negative to growth. Rapid population growth depresses savings and retard physical capital [18]. From the result, trade openness is vital in growth probably since openness encourages competition and efficiency [14]. In contrast, terms of trade were unproductive and it can be attributed to price fluctuations of primary products.



Fig. 2. Map of East African Community
Source: EAC [22] Kaboro and Mose [23]

Table 1. LLC Unit Root Test Results

Variables in Logs	Levin-Lin-Chu at Level		Order	LLC at First difference		Order
	Unadjusted t	Adjusted t		Unadjusted t	Adjusted t	
<i>ln y</i>	-5.5309	-3.2789	I(0)	—	—	—
<i>ln g</i>	-4.8545	-2.6132	I(0)	—	—	—
<i>ln c</i>	-2.0781	-0.0564	I(1)	-7.6901	-5.0570	I(0)
<i>ln h</i>	-1.1185	0.7759	I(1)	-9.0697	-6.2458	I(0)
<i>ln a</i>	-1.7508	-0.0060	I(1)	-6.7663	-3.9830	I(0)
<i>ln o</i>	-1.3804	0.2276	I(1)	-6.6571	-3.7979	I(0)
<i>ln t</i>	-2.7023	-0.1778	I(1)	-6.3576	-3.1815	I(0)
<i>ln p</i>	-3.6390	-1.0393	I(1)	-8.1229	-5.3380	I(0)

Table 2. Statistical relationship results

Variable	Coefficient	Standard error	t- Statistics	P-value
<i>cons</i>	4.28***	1.368	3.13	0.002
<i>ln g</i>	0.49**	0.175	2.82	0.046
<i>ln r</i>	-2.30***	0.808	-2.84	0.006
<i>ln h</i>	0.53*	0.302	1.76	0.220
<i>ln o</i>	0.95**	0.479	1.99	0.051
<i>ln a</i>	0.76**	0.165	4.60	0.044
<i>ln t</i>	-1.29	0.978	-1.32	0.319
<i>ln p</i>	-2.36***	0.134	-17.64	0.003
Goodness of Fit Test	R ² = 0.36		Adjusted R ² = 0.31	
F(7,85) = 5.862	P-value(F) = 0.000		Durbin.W = 1.812	
Wooldridge Test	F(1,2) = 10.035		Prob > F = 0.087	
Modified Wald Test	χ^2 (3) = 1.39		Prob> χ^2 = 0.708	
Breusch-Pagan Test	χ^2 (3) = 4.518		Pr = 0.211	
Hausman χ^2 (10) = 19.64	Prob> χ^2 = 0.033			

Adjusted R² is 0.33 implying that explanatory variables explain 33% of the dependent variable. The F test result reveals that independent variables have explanatory power on the explained variable at a 1 % level of significance. A modified Wald test was carried out to test for heteroskedasticity and from the result, heteroskedasticity is not a problem. The contemporaneous correlation was tested using (B-P/LM) test of independence and from the result cross-sectional dependence/ contemporaneous correlation is not a problem. For the Wooldridge test, the null is no serial correlation (0.07). From Table 2 result, the p-value is greater than 0.05, the study fails to reject the null hypothesis and concludes that the data does not have the first-order autocorrelation. Durbin Watson is equal to 1.8, which implies autocorrelation may not be a problem.

5. CONCLUSION AND RECOMMENDATIONS

This study has determined the effects of capital expenditure on the real GDP growth rate in a set of East African countries economies a period of 30 years (1985 to 2015). It follows that to achieve accelerated output growth, government capital spending should be such that it creates a conducive environment for the private sector development and repairs market failures. The results reveal that the spending on capital infrastructure should be a top priority for a government interested in promoting economic growth. In addition, empirical results and Neoclassical theories consider recurrent spending ineffective on the grounds of the crowding-out effects, that is, when public goods

are substituted for private goods, this causes lower private spending on education, health, infrastructure, and other goods and services. The governments should increase their own investment in areas that are beneficial to the private sector and move away from those that compete with or crowd it out. In the same vein, reducing recurrent expenditure to prop up government investment is a policy recommendation worthy of pursuing.

5.1 Areas of Further Research

From the findings of this study, there is a need for further expenditure data disaggregation into private and public capital government expenditure for deeper policy prescription.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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