

*Original Paper*

Government Expenditure and Economic Growth  
in Sub-Saharan Africa

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**Abstract**

*The paper sought to investigate the effect government expenditure on economic growth in Sub-Saharan Africa using a panel data for 35 Sub-Saharan African countries for the period 2006-2018. The paper adopted dynamic panel data and estimates were achieved by using two-step system GMM while taking into account the problem of instrument proliferation. The paper provided evidence that education and health expenditure are key determinants of income growth for SSA. The impact of education spending on cross-country income variation is more effective in low income SSA countries than the middle income SSA countries. However, military expenditure on output growth is more effective in improving income level of middle income SSA countries than low income SSA countries. SSA countries should allocate more funding towards education sector and should also avail compulsory and free primary and secondary education. SSA should carry out health reforms which improve primary health and universal health insurance coverage.*

**Keywords**

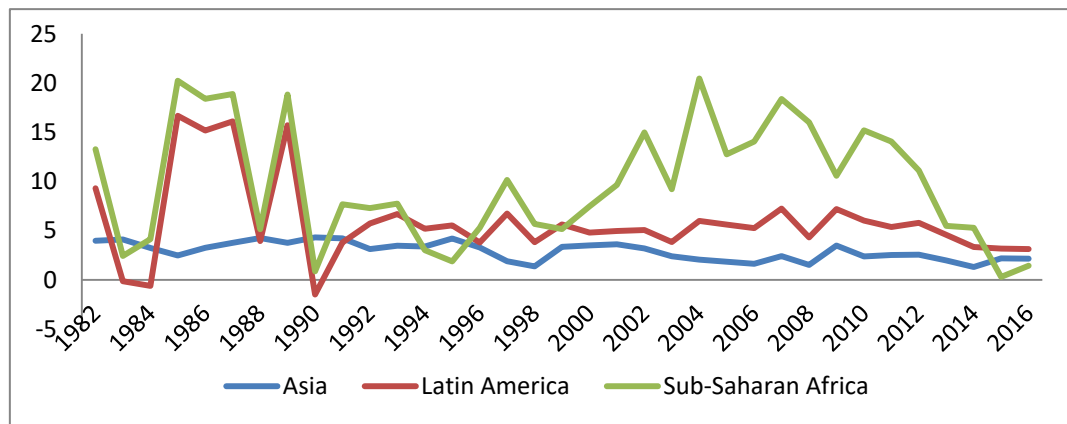
*government expenditure, economic growth, income level, two-step system GMM*

**1. Introduction**

A number of scholars have explored the nexus between government expenditure and economic growth (Devarajan et al., 2013; Barro, 1990; Kimaro et al., 2017), and among many other researchers. Of interest to researchers is whether fiscal discipline contributes to output growth equation. One view is that public spending on human capacity building, infrastructure, and health enhance economic growth although financing of such government expenditure is associated with tax distortion which can be growth-retarding.

The public sector has expanded significantly over the years for various countries. At the beginning of the twentieth century, public sector for many countries was small. However, expenditure increased gradually for the next sixty years. For Sub-Saharan African (SSA) countries, the public sector has grown from 18.5 percentage of GDP in the 1980s to about 29 percentage of GDP in 2018. However, SSA has experienced dwindling economic performance despite the increase in public expenditure.

Figure 1 illustrates the trend in annual percentage growth of government expenditure for developing regions. Between 1982 and 1984, public spending fell in SSA. This was attributed to a prolonged period of drought and the aftermath of the second oil shock (Sahn, 1992). Comparison between SSA region and low-income regions like Asia and Latin America reveals that SSA registered a steady increase in government expenditure from 0.47 percent in 1990 to 14.45 percent in 2004. The increase in government expenditure in SSA resulted from many SSA countries adopting policy reform programs in response to the growing current account imbalances and poor economic performance (Sahn, 1992). However, government expenditure varies across countries. A country like Botswana registered an average total expenditures growth of about 7 percent annually since the beginning of the year 2000 compared to Asia's giants (China and India) while Cote d'Ivoire, Togo, and Zimbabwe have slumped in growth (Fan & Saurkar, 2008).



**Figure 1. Government Expenditures in Developing Regions, 1982-2016**

SSA has experienced mixed economic performance despite the increase in government expenditure. Garner (2006) suggested four classifications of SSA countries based on their growth performance; positive growth, negative growth, stagnation in growth and uneven growth. During the time period 1990-2017, the following countries have shown consistent and positive growth; Botswana, Cape Verde, Burkina Faso, Gambia, Ghana, Mauritius, Mozambique, Tanzania, Seychelles, Kenya and Lesotho. Consistent with negative growth are Zimbabwe, DRC, Central Africa Republic and Burundi. Countries in SSA that have stagnated in growth are: Gabon, Guinea-Bissau, Niger, Togo while Liberia, Malawi, Gambia Cote d'Ivoire are associated with uneven growth. Low income SSA countries have experience unsatisfactory economic growth compared to other regions (Asiedu, 2002).

Most of the SSA countries with negative and stagnating growth fall under low-income category. This is according to World Bank Classification 2018. SSA has 48 countries out of which 24 have GNI per capita less than USD 995 and therefore are classified as low income-countries (World Bank Classification, 2018). However, the remaining 24 countries with GNI per capita between USD 996 and USD 12055 are classified as middle income countries. Of interest to both researchers and policy makers is to unravel why some countries have moved to middle income category while others have remained as low income economies. Why is the process of public resource allocation working in countries like Botswana while countries like Central Africa Republic have not experienced better economic performance?

There exists vast literature that examines the relationship between output growth and public spending for SSA countries (Sahn, 1992; Kimaro et al., 2017; Akinlo, 2008; Kagundu, 2006; Gyimah-Brempong et al., 2004; Menyah, et al., 2013; Nurudeen & Usman, 2010). However, these studies focussed on the impact of public spending on output growth in SSA without considering the mixed economic performance of the individual countries. None of these studies have dichotomized SSA countries into low and middle income countries. Knowledge on which components of government expenditure contribute significantly and positively towards output growth for low and middle level economics SSA will be of great importance for policy makers. Policy action based on these empirical findings will be useful in designing policies that are specific to each income level of SSA countries. By classifying SSA countries into two categories of low and middle income group, this study uniquely adds to literature on output growth and public spending.

Novelty of this paper originates from analysing public expenditure and growth by considering the income level of SSA countries. First, this is virtually the first study to conduct an analysis based on the World Bank classification of SSA according to income level. This is imperative in drawing inferences on the effects of spending on output growth of low and middle income countries in SSA. Some previous studies classified SSA countries in terms of regional location. However, some countries share same geographical region but with fundamentally different economic prospects. The analysis based on income classification will inform policy makers on what low income countries need to adopt in the process of resource allocation. This will be instrumental in improving their economic prospects and they can also borrow some lessons from middle income economies. Equally, the result from this study will form the basis for policy makers in the middle income countries on policy action plan necessary to attainment high income status.

Secondly, the study contributes in terms of methodology. The application of difference and system generalised methods of moments (GMM) for dynamic panel data has increased among researchers since it was established by Arellano and Bond (1991). GMM is considered to be efficient as it solve the problem of fixed effects and endogeneity of regressors. However, both system and difference GMM suffer from instrument proliferation (Roodman, 2009). This is associated with the poor performance of instrumental variables (IV). Previous studies that have employed GMM estimators have not attempted

to correct the problem of too many instruments. Therefore the parameter estimates might be biased. This study hence implemented solutions suggested by Roodman (2009) in handling the problem associated with too many instruments in GMM. The solution involves collapsing instruments count and limiting lag depth amounts. This paper consequently examined the effect of government expenditure on cross-country income variation for SSA countries. Secondly, the study sought to analyse if the effect of government expenditure on output growth varies with the income level of SSA countries.

## 2. Literature Review

The nexus between government expenditure and output growth can be explained by a number of theories. First, Wagner's law postulates that state activities in relation to private economic activity increases in the process of economic development (Bird, 1971). According to Wagner's law, complexity of government structure leads to the growth of the economy. This is necessitated by the need to introduce statutory laws and the development of legal structure which increases the public sector expenditure. Wagner law further opines that the urbanization process is associated with externalities which call for government intervention to mitigate their effects. Government interventions to curb externalities result in the introduction of new laws, policing and authorities consequently leading to the expansion of public sector. According Wagner, proliferation of cities require protection of property rights, extra security for the urban dwellers, legislation to govern externalities and this would result to an expanded public sector.

Second, Keynes, in "The General Theory of Employment, Interest and Money" proposed that state intervention in economic activity is necessary since economies do not stabilize very quickly (Keynes, 1973). According to Keynes, there is need for government spending to increase employment when the economy is in depression. Government spending is necessary for promoting growth. Keynes believed that microeconomic interventions by both firms and individuals can lead to inefficient macroeconomic outcomes leading to a general glut where the economy operates below its potential output and growth rate. While classical economists believed in Say's law, Keynes believed that economic downturn characterised by high unemployment and loss of potential output occurs due to insufficient aggregate demand for goods. Keynes proposed government intervention during economic depression to increase aggregate demand for goods and services to boost economic activities thereby reducing unemployment. Keynes further argued that economic stimulation through low interest rates and government investment can solve the problem of economic depression. Government investment has the multiplier effect by stimulating spending in the general economy and this in turn encourages more production and investment.

Third, crowding out theory postulates that expansionary fiscal policy where government finances expenditure through taxes or debt issuance results to crowding out. Crowding out is manifested in several ways. First, when the state finances its expenditure through deficit financing by borrowing in the domestic market it competes with the private sector for the available funds. Government competition with the private sector makes interest rate bearing funds too expensive for the private

sector thus leading to shrinking of the private sector borrowing. Inadequate funds for the private sector reduce private investment resulting in low aggregate demand. Reduced private investment negatively effect on overall economic performance. Secondly, Crowding out can occurs through government spending which crowds out private spending. State intervention in the provision of public goods like education can crowd out private spending in some of these sectors. Efficient provision of public services by the government can create low demand for similar goods in the private sector hence discouraging private sector investment. Lastly, indirect crowding out occurs when government expenditure is financed through increased taxation thereby reducing private savings. A decrease in private savings is associated with low investment undertakings and this could result in low aggregate demand subsequently leading to slow economic growth.

Fourth, Neo-classical advanced by Solow-Swan (1956) is premised on the idea that increasing physical capital results in diminishing returns thus capital has a transitional effect on economy income level. The theory therefore suggests that it is necessary to increase labour productivity to spur economic growth. Accordingly, steady state economic growth can be achieved through accumulation of capital, labour, and advances in technology. The theory states that an equilibrium state can be achieved by varying the right quantities of capital and labour in the production function. Technological changes significantly augment output therefore output growth cannot be realized in the absence of advanced technology. Neo-classical growth theory thus suggests an investments in modern technology to augment the existing labour force to enable steady economic growth rate.

Finally, endogenous growth theory postulates that steady economic growth is achieved through technological change that is endogenously determined (Frankel, 1962; Romer, 1990; Mankiw et al., 1992; Barro et al., 1992; Karras, 1996). Government investment in R&D and human capacity building is associated with increase in economic growth. Endogenous growth model predicts that an increase in the proportion of people working in the research and development and the knowledge sectors will increase economic growth of a country. Therefore countries can stimulate growth by investing in capital, education and R&D. This theory emphasizes that the key to economic growth is investment in education. Barro (1990) predicts that public spending has both temporary and permanent effect on income growth. Barro (1991) conducted a cross sectional study on economic growth for 98 countries. The study used OLS estimation technique to arrive at the estimates. Finding showed that government consumption expenditure negatively impacts economic growth. This was attributed to distortions emanating from tax rates that discourages investment hence inhibits growth. For 96 non-communist countries between 1960 and 1970, Landau (1983) analysed spending and output growth. OLS inference approach was used by the author. Findings provided evidence that public spending by government negatively impacts income growth.

Devarajan (1996) employed OLS and fixed effect estimation technique for 43 least developed countries for the period 1970-1990 to approximate the nexus between government expenditure and income variation. The study found that productive expenditure (health, education, communication, capital, and transport) either negatively or insignificantly impacts on growth while unproductive expenditure

(current expenditure) was found to be growth-enhancing. Hansson and Henrekson (1994) applied OLS regression to study the effect of spending on income growth. The study used 14 OECD countries for the period 1970-1987. To circumvent the problem of endogeneity and spurious regression, the study examined the link between spending and productivity at a disaggregated level. The result showed that government spending on education positively influence growth while transfer and consumption spending negatively impacts income level.

Fölster et al. (1994) studied the effect of fiscal policy on income for 22 OECD countries for the period 1970-1995. The study found that government expenditure negatively impacts growth for rich countries. Adopting a panel data for 100 countries from the year 1970-1988, Easterly et al. (1993) analysed the impact of fiscal policy on income. OLS regression technique was used to estimate the model. The study found that productive expenditure (transport and communication expenditure) positively correlate with growth. Landau (1986) studied spending on growth for 96 undeveloped countries for a period spanning 1961 to 1976. To avoid the problem of relationship between regressors and the disturbance, the study employed OLS with lagged values of regressors. In the findings, expenditure on military and transfer payments insignificantly impact output. Results further showed that consumption expenditure negatively impact income growth.

Using annual growth rate for 16 developed countries for the period 1952 to 1976, Landau (1985) analysed statistical relationship of spending and income growth. The paper used OLS estimation technique. The paper predicted that government expenditure in general impedes income per capita products while expenditure on transfers has positive link with growth. Ram (1986) examined the significant function of government on income growth. The study predicted that government size positively impact income. Bose et al., (2007) based on aggregate and disaggregated public expenditure data for 30 undeveloped countries for the period 1970-1990 analysed the effect of public spending on output growth. The paper used seemingly unrelated regression (SUR) approach for estimation. The analysis suggested that at the aggregated level, government capital expenditure positively influence income level. At the disaggregate level, education spending has a long-lasting effect on output growth.

Afonso et al. (2010) analysed two samples of 15 EU and OECD countries to investigate the effect of the size of the government stimulate on output growth. The study used both pooled panel and fixed effect estimation technique. The result predicted that government size negatively influences income level. Yasin (2011) concluded that government expenditure on capital formation significantly improves income level while Kwendo et al. (2015) found that agriculture and defence expenditure negatively impact on income level while health and consumption expenditure positively impact on economic growth. Loizides et al. (2005) showed that public expansion enhances income level. Gyimah-Brempong (2004) analysis revealed that stock of human capital significantly improves income level. Wu et al. (2010) investigated the contribution of spending on income level for 182 countries for the period 1950-2004. The result showed reverse causality between spending and income level. The finding further showed that the impact of spending on growth varies with income level of each country.

Kimaro et al. (2017) provided evidence that government spending positively predicts income level of low income SSA countries. Dunne et al. (1995) found that military spending negatively impact economic growth. Obialor (2017) study concluded that health and education spending positively and significantly impact output growth for Nigeria. Maingi (2010) study indicated that productive government expenditure (infrastructure, investment, economic affairs, health and defence) improves income level. However, the study revealed that expenditure on debt service negatively predicts income level. Maingi et al. (2013) investigated how government spending contributes to income level variation among member states of East Africa. The findings showed that health and defence expenditure positively and statistically impact growth while education and agriculture expenditure were non-significant. Musila and Balassi (2004) studied the link between education spending and income level in Uganda from 1965 to 1999 and results revealed that that education expenditure positively and significantly predicts income level both in the short run and in the long run.

Three observations can be made from the review. First, studies that relate spending and output growth are inconclusive. Secondly, there is no study which has been conducted on the middle income countries in SSA except Kimaro (2017) who examined the effect of spending on income level of low income countries in SSA. Third, there exists a gap in the methodological approaches for estimating government expenditure on income variation for SSA countries. Most cross-country studies employ pooled regressions, statistic model (fixed effect and random effect) and dynamic GMM. The method of GMM controls for endogeneity, heterogeneity and stationarity. GMM yields estimates that are more robust than those from standard panel data methods or time series methods. However, studies that used GMM did not remedy instrumental proliferation problem which is associated with GMM. This paper, besides using GMM, will adopt Roodman (2009) approach to surmount problems associated with GMM.

### 3. Method

#### 3.1 Theoretical Framework

The theoretical model is adopted from Devarajan et al. (1996). The model links state spending and income level. The model distinguishes between productive and unproductive spending. In this framework, productive expenditure is associated with positive outcome in economic growth while unproductive expenditure negatively impacts income growth. The framework further assumes that the composition of state expenditure is exogenously determined by policy. The model captures the difference between productive and unproductive expenditure by how a shift in the two changes the growth rate of a country.

The model assumes Cobb Douglas production function. Production is explained by private capital ( $k$ ), productive spending and unproductive spending,  $g_a$  and  $g_b$  where  $g_a$  is productive spending while  $g_b$  is unproductive spending. The function is expressed as in equation (1)

$$y = f(k, g_a, g_b) = k^\beta g_a^\delta g_b^\varphi \quad (1)$$

Where,  $\delta, \varphi \geq 0, \beta + \delta + \varphi = 1$

The government is assumed to finance its spending by assuming a balanced budget and imposing a flat tax-rate ( $\tau$ ).

$$\tau y = g_a + g_b \quad (2)$$

The proportion,  $\emptyset$  ( $0 \leq \emptyset \leq 1$ ), of tax revenue goes towards productive expenditure ( $g_a$ ). Therefore  $g_a$  and  $g_b$  is given as:

$$g_a = \emptyset \tau y \text{ and } g_b = (1 - \emptyset) \tau y \quad (3)$$

The problem of a representative agent taking the government decision on  $\tau$  and  $\emptyset$  is to optimize his satisfaction by choosing consumption,  $c$ , and capital,  $k$ .

$$U = \int_0^{\infty} u(c) e^{-\rho t} dt \quad (4)$$

Subject to

$$\dot{k} = (1 - \tau)y - c \quad (5)$$

Where  $\rho$  denotes time preference. A utility function with a constant elasticity of marginal utility is specified as:

$$u(c) = \frac{c^{1-\theta} - 1}{1-\theta} \quad (6)$$

Hamiltonian function is set up as follows to get the growth rate of consumption

$$H = e^{-\rho t} \frac{c^{1-\theta} - 1}{1-\theta} + \eta((1 - \tau)k^\beta g_a^\delta g_b^\varphi - c) \quad (7)$$

Obtaining Hamiltonian first order conditions, the growth rate of consumption can be rewritten as;

$$\frac{\dot{c}}{c} = \frac{(1-\tau)\beta k^{\beta-1} \emptyset^\delta (1-\emptyset)^\varphi g^\delta g^\varphi - \rho}{\theta} \quad (8)$$

Assume the steady-state growth rate of consumption is represented by  $Q$  such that equation (8) is written as;

$$Q = \frac{(1-\tau)\beta k^{\beta-1} \emptyset^\delta (1-\emptyset)^\varphi g^\delta g^\varphi - \rho}{\theta} \quad (9)$$

From equation (9) the proportion of government expenditure devoted for productive expenditure ( $g_a$ ).

$$dQ/d\emptyset = \frac{(1-\tau)\beta k^{\beta-1} g^{\delta+\varphi} [\delta - \varphi(1-\emptyset)^{\varphi-1}]}{\theta} \quad (10)$$

Productive expenditure can now be defined as that component of public expenditure whose increase in proportion will raise the steady-state growth rate of the economy. From equation (10), component  $g_a$  is productive if  $dQ/d\emptyset > 0$ .

### 3.2 Empirical Model

In estimating the effect of government expenditure on economic growth, the baseline model is specified as:

$$GRGDP(t) = f((K(t), L(t), ED(t), INFR(t), HLT(t), MLT(t), X(t))) \quad (11)$$

The components of government spending includes: education spending (ED), infrastructure spending (INFR), health spending (HLT) and military spending (MLT). X represent control variables which



include: savings, inflation and lagged GDP growth rate. Savings is expected to positively predict income level as suggested by Modigliani (1970). Inflation captures the effect of macroeconomic instability on growth and expected to negatively predict economic outcomes. There exists dynamic interaction between a country's current economic performance with that of the previous income level, i.e., the economic activities in the preceding year have a bearing on current economic activities. Therefore lagged values of GDP growth rate was included in the model. The study therefore adopted dynamic panel model. The parameter estimates for infrastructure expenditure is expected to be positive. From theoretical literature, government provision of infrastructure such as roads, highways, street lights, airports and mass transit provides enabling environment for growth. Based on literature, military spending influence on income level is indeterminate. Military spending provides security and helps protect property rights which increase business performance. However, military spending can retard growth since higher military spending implies lower level of domestic investment.

The following equation was estimated to examine how government expenditure influences economic growth in SSA.

$$GRGDP_{it} = \delta_{0i} + \delta_1 GRGDP_{it-1} + \delta_2 K_{it} + \delta_3 L_{it} + \delta_4 ED_{it} + \delta_5 INFR_{it} + \delta_6 \ln HLT_{it} + \delta_7 MLT_{it} + \delta_8 INF_{it} + \delta_9 DS_{it} + v_{it} \quad (12)$$

Where  $v_{it}$  is the disturbance and is composed of fixed effect and time-specific effects.

Equation (12) is further modified to include dummy variable for middle-income SSA countries. Two income categories of SSA was included; the middle income and lower income group. Therefore instead of estimating two different equations for each group, dummy variable was included in the empirical model.

For example

$$y_{it} = \begin{cases} y_{it} = \gamma_{0i} + \gamma_1 x_{it} + u_{it} & \text{for middle income countries} \\ y_{it} = \gamma_{1i} + \gamma_1 x_{it} + u_{it} & \text{for low income countries} \end{cases}$$

Where

$$D = \begin{cases} 1 & \text{if the country is middle income} \\ 0 & \text{if the country is low income} \end{cases}$$

The variable D is the dummy variable. The coefficient of D measures the difference in the two intercept terms. Therefore equation (13) can further be modified to include a dummy variable such that;

$$GRGDP_{it} = \delta_{0i} + \delta_1 GRGDP_{it-1} + \delta_2 K_{it} + \delta_3 L_{it} + \delta_4 ED_{it} + \delta_5 INFR_{it} + \delta_6 \ln HLT_{it} + \delta_7 MLT_{it} + \delta_8 INF_{it} + \delta_9 DS_{it} + \xi D + v_{it} \quad (14)$$

Where  $\xi = (\delta_{1i} - \delta_{0i})$

Equation (14) is modified to include the interactions involving the middle income and dummy variables. This is to test whether the effect of spending on output growth varies with income level of countries. Equation (14) thus becomes;

$$GRGDP_{it} = \delta_{0i} + \delta_1 GRGDP_{it-1} + \delta_2 K_{it} + \delta_3 L_{it} + \delta_4 ED_{it} + \delta_5 INFR_{it} + \delta_6 \ln HLT_{it} + \delta_7 MLT_{it} + \delta_8 INF_{it} + \delta_9 DS_{it} + \xi D + \delta_{10} Comp_{it} * D + v_{it} \quad (15)$$

$Comp_{it}$  is the component of government expenditure for a given country and at a given time while  $\delta_{10}$  captures the coefficient of the interaction term between each component of government expenditure and the middle income dummy variable. Therefore  $\xi$  measures the difference in intercept between middle and lower income countries in SSA while  $\delta_{10}$  measures the difference in the effect of spending between middle and lower income economies in SSA. Equation (15) potentially suffers from several econometric problems. First, from empirical literature, capital, education, infrastructure, health and military expenditure are endogenous. Endogeneity emanates from reverse causality with economic growth. Secondly, the unobserved time-invariant country specific effect maybe associated with the  $X$  variables. Thirdly,  $GRGDP_{it-1}$  as an explanatory variable may lead to the problem of autocorrelation. Lastly, the dataset used in this paper has short time period ( $T=10$ ) and a large country dimension ( $N=35$ ). Both the random effect and fixed effect are inconsistent estimators when we have lagged dependent variables in the right hand-side of equation. In the presence of dynamic and endogenous independent variables, both system and difference GMM provide consistent estimates (Roodman, 2009). System and difference GMM are both suitable for small  $T$  and large  $N$  with dynamic dependent variable and fixed effects. To surmount problems associated with difference GMM, Blundell and Bond (1998) and Arellano and Bover (1995) proposed system GMM. System GMM augments difference GMM by estimating the two equations simultaneously at both levels and at first difference. System GMM results to additional instruments which increases efficiency. However, system GMM suffers from the problem of instrument proliferation. Roodman (2009) suggested collapsing the instruments count as a possible remedy to the problem of too many instruments. This paper therefore estimated equation (15) using two-step system GMM and collapsed the number of instruments. Instrument validity was checked using Sargan over identification test while Arellano-Bond was used to test serial correlation.

Equation 15 of the dynamic GMM presents the short run coefficients of regressor's measuring the immediate response of the expenditure variables and control variables on economic growth. According to Bruno et al. (2017), long-run coefficients capture the persistence of the dependent variables on growth. Therefore long-run coefficients in dynamic GMM are achieved by:

$$LR - coefficients = \frac{\delta_k}{1 - \phi}$$

Where  $\phi$  is the coefficient of lagged dependent variable ( $GRGDP_{it-1}$ ) while  $\delta_k$  is the short run coefficients estimates.

## 4. Results

### 4.1 Descriptive Statistics

This paper used panel data for 35 Sub-Saharan African countries for the period 2006-2018. The data was sourced from world data indicator (2018). The dependent variable include GDP growth rate while independent variables comprised of education expenditure, health expenditure, military expenditure, labour force, inflation and fixed capital formation.

Table 1 displays descriptive statistics based on means and standard deviation. In particular, Table 1 reports mean for variables for pooled observation for SSA, middle-income groups and low-income groups. The pooled mean GDP annual growth rate for the 35 SSA countries during 2006 to 2018 was 4.53 percent. However, the average growth rate for middle income countries stood at 4.6 percent with low income countries registering an average growth rate of 4.47 percent. Education spending was high in the middle income countries (5.10 percent of GDP) compared to the overall spending on education by SSA countries (4.28 percent). Low income countries spend an average of 3.7 percent of GDP on education. In terms of government expenditure on health, the pooled mean for SSA countries was 6.04 percent with middle income countries spending an average of 2.8 percent on health while low income countries spending on health was highest at 8.19 percent of GDP. Military expenditure for middle income countries on the average was higher than for both the pooled and low income SSA countries. The average military spending was 1.79 percent for middle income countries, 1.65 percent for pooled SSA and 1.56 percent for low income countries.

Average inflation was recorded highest in low-income group at 104.457 percent compared to middle-income group with low inflation of 7.56 percent. The pooled mean inflation for SSA countries was 65.70 percent. On average, labour force for pooled SSA countries was 52.10 percent of the working age population while middle income countries have an average labour force of 42.07 percent with low income countries recording an average of 57.79 percent labour force. Middle income countries had the highest mean of fixed capital formation of 22.35 percent with low income countries recording an average of 18.53 percent of fixed capital formation. The descriptive statistics further shows that mean domestic saving was highest in middle income economies of SSA (17.69 percent), low income level economies of SSA had a mean of 2.43 percent and pooled mean for SSA countries was 8.43 percent.

**Table 1. Descriptive Statistics**

Variable	SSA			Middle-Income SSA countries			Low-income SSA countries		
	Obs	Mean	Std.Dev.	Obs	Mean	Std.Dev.	Obs	Mean	Std.Dev.
GDP annual(percent)	455	4.535173	4.847151	182	4.624263	3.98084	273	4.475779	5.353648
Education	455	4.28748	2.086798	182	5.105493	2.482839	273	3.742138	1.555706
Health	455	6.04436	14.02473	182	2.817745	1.538712	273	8.195437	17.75156
Military	455	1.655077	1.126365	182	1.793001	1.319136	273	1.563128	0.9687337
Inflation	455	65.70173	1145.341	182	7.568872	6.888506	273	104.457	1478.431
Labour force	455	52.10555	15.30606	182	42.07362	12.22271	273	58.79351	13.39354
Capital	455	20.06598	8.68033	182	22.35933	9.285973	273	18.53708	7.906899
Domestic Saving	455	8.432712	20.88508	182	17.42304	17.6928	273	2.439157	20.72687

*Source:* Author's own computation from stata.

#### 4.2 Government Expenditure and Growth in SSA Countries

Table 2 displays the estimates that relate public spending and income level across SSA and across different income levels of SSA countries. The Arellano-Bond autocorrelation test suggests no correlation in the second first difference disturbances of these models. The significance level of the Sargan test statistic validates the instruments. Diagnostic tests suggest the models correctly predict the income level. The coefficient of the lagged GDP growth rate in model 1 significantly enhances output growth ( $p < 0.001$ ). This shows that growth persistence by one percent improves income level by 0.206 percent in the short run. Return on education expenditure is significantly ( $p < 0.05$ ) and positively associated with economic growth. *Ceteris paribus*, 1 percent increase in education expenditure predicts 0.199 percent improvement in income level for SSA in the short run. The finding validates Devarajan (1996) and Obialor (2017) who found a similar result. The parameter estimate for health expenditure is positive and significant ( $p < 0.05$ ). This illustrates that 1 percent rise in health expenditure will boost income level by 0.034 percent in the short run. Military expenditure has an insignificant coefficient and negatively influences income level in the short run.

Inflation positively and significantly influences GDP growth in the short run ( $p < 0.05$ ). Therefore 1 percent increase in inflation is associated with 0.0001 percent decrease in income level. Thus the magnitude of the effect of inflation on output in SSA is marginal. Productive labour force significantly improves GDP growth. One percent increase in labour force productivity will enlarge output by 0.0512 percent in the short run. The coefficient of the dummy variable is statistically significant ( $p < 0.1$ ). The output growth of middle income economies is 2.26 percent greater than those of low income category in the short run. Model 2 provides the beta estimates for the interaction term between education expenditure and the dummy variable. The beta estimates of the interaction term is negative and significant ( $p < 0.001$ ). This illustrates that the effect of education expenditure on output growth is less in middle income SSA countries than in low income SSA countries. In particular, income level of middle income SSA countries will grow by less than 2.031 percent as compared to low income SSA countries for every 1 percent additional expenditure on education.

The interaction term in model 3 tests if the effect of military expenditure on income growth differ by income level of SSA countries. The interaction term for military expenditure is positive and statistically significant at 1 percent level. This suggests that the impact of military expenditure on income growth for middle income SSA countries is more than for low income SSA countries. Output growth in middle income SSA economies will be 4.08 percent higher than low income SSA economies for 1 percent increase in military expenditure. Model four captures the interaction term on the return to health expenditure. The beta estimate of the interaction term on health expenditure is positive but non-significant.

**Table 2. The Effect of Government Expenditure on Growth in Middle Income SSA-Short-run Estimates**

	Model 1 (LDPD)	Model 2 (LDPD)	Model 3 (LDPD)	Model 4 (LDPD)		
VARIABLES	GDP	GDP	GDP	GDP		
L.GDP	0.206*** (0.00930)	0.167*** (0.0108)	0.209*** (0.0195)	0.206*** (0.00935)		
Education	0.199** (0.0948)	0.902*** (0.146)	-0.00882 (0.0989)	0.198** (0.0958)		
Education*Middle		-2.031*** (0.436)				
Health	0.0340** (0.0137)	0.00342 (0.00939)	0.171** (0.0799)	0.0305** (0.0137)		
Military	-0.565 (0.344)	-0.944*** (0.193)	-2.001*** (0.257)	-0.548 (0.367)		
Inflation	-0.000108*** (1.24e-05)	-0.0057705*** (1.23e-05)	-0.000163*** (1.63e-05)	-0.000109*** (1.25e-05)		
Labour	0.0512*** (0.00813)	0.0288*** (0.00580)	0.114*** (0.0135)	0.0511*** (0.00840)		
Middle (Dummy)	2.267* (1.126)	10.09*** (1.427)	-8.756*** (2.329)	2.121 (1.403)		
Military*Middle			4.089*** (0.879)			
Health*Middle				0.0662 (0.226)		
Observations	420	420	420	420		
Number of ID	35	35	35	35		
Diagnostic tests			Model 1	Model2	Model3	Model4
F-Test, (p-value)			2053.82 (0.000)	335.07 (0.000)	674.74 (0.000)	1942.20 (0.000)
Sargan Test chi2, (p-value)			32.22 (0.938)	28.67 (0.972)	28.19 (0.976)	32.18 (0.924)
Arellano-Bond Autocorrelation test (AR2) z-value (p-value)			1.31 (0.190)	0.58 (0.563)	1.25 (0.211)	1.31 (0.190)

Standard errors in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

Table 3 provides long-run estimates of the relation between spending and output growth. A percentage change in education expenditure is associated with 0.25 percent increase in income level in the long run. The result demonstrates that education expenditure has a significant larger effect on output growth in the long run (0.25) than in the short run (0.199). Health expenditure significantly explains output variation in SSA in the long run. Output will grow by 0.042 percent in the long run for 1 percent rise in health spending. Health expenditure has a larger positive effect on output growth in the long run (0.042) than the short run effect (0.0340). However, in the long run, military expenditure negatively impacts on output growth albeit non-significant.

**Table 3. The Effect of Government Expenditure on Growth in SSA-Long-run Estimates**

Variable	Coef.	Std.Err.	z	P> z
Education	0.250603	0.121071	2.07	0.038
Health	0.042884	0.017002	2.52	0.012
Military	-0.71186	0.4366216	-1.63	0.103
Inflation	-0.00014	0.0000153	-8.91	0.000
Labour	0.064547	0.0105648	6.11	0.000
Middle	2.855703	1.394178	2.05	0.041

## 5. Conclusion

The study sought to analyse the effect of government expenditure on economic growth in Sub-Saharan Africa. The analysis reveals that both education and health expenditure significantly predicts an improvement in income level of SSA countries. Military spending does not predict income level of SSA countries both in the long run and in the short run. Education and health spending effectively predict income level in the long period than in the short period. The study provided evidence that education spending is more effective in improving output level of low income SSA countries than in middle income countries. Military expenditure significantly improves income level of middle income economies of SSA countries than low income SSA countries. In contrast, health expenditure does not significantly predict income variation for SSA countries. Productive labour force is associated with significant and positive effect on income level. Inflation meets the priori expectation of negative influence on income level of a country.

The study underscores the need for the governments to increase budgetary allocation for education and military expenditure. Funding in education will enhance provision of quality education infrastructures and better remuneration of teachers which will enhance literacy. Low income countries should also consider free and compulsory primary and secondary education. This will work towards improved literacy level and consequently impact on growth. Policy makers in the education sector need to introduce skill based courses, technical institutions and the government should invest locally to create

employment opportunities. Creation of employment opportunities locally will discourage brain drain. Military expenditure for middle income countries should be expanded but with a caution. The government in middle income countries should consider external borrowing rather than domestic borrowing in funding military expenditure. Domestic borrowing has the crowding out effect which might retard growth. Low income countries should cut on budgetary allocation for military expenditure. Some of the money spent on military should be diverted to productive expenditure like building roads and schools which have multiplier effects on the economy. SSA needs to address health reforms through increased funding towards social policies which involve improved primary health and universal health insurance coverage as well as R&D to eliminate tropical diseases such as malaria.

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