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Does Government Education Expenditure Affect Educational Outcomes? New Evidence from Sub-Sahara African Countries

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Abstract

The human capital crisis, reflected in the weak global competitiveness of African education, has questioned the effectiveness of public spending in increasing educational outcomes in the continent. Thus, this article examines the impact of government education expenditure on educational outcomes in 31 sub-Saharan African (SSA) countries from 2000-2019 based on a Generalized Method of Moments (GMM). The study sheds light on the priorities of government education spending in the continent. Findings showed that the effect of government education spending on educational outcomes in SSA was driven by the measure of educational outcome used. Government spending in Africa had focused mainly on primary and secondary education to the detriment of tertiary education because it is convenient and generates political gains. Due to institutional rigidities which emanate from the governance structure, the inequitable allocation of government funding had made higher education in Africa less responsive to the changes in global knowledge and labour market demands. Therefore, the following policy agenda becomes imperative in the SSA: (i) government education spending should equitably target all education levels to improve the aggregate human capital development indicators in the region. (ii) There is a need to enhance government institutions' capacity to increase their level of effectiveness and performance.

JEL Classification Codes: E24, E52, E62, J17, J21, J24**Keywords:** Government Education Expenditure; Educational Outcomes Higher Education; System GMM; sub-Saharan Africa.

1. Introduction

This study examined the impact of government education expenditure on educational outcomes in sub-Saharan Africa (SSA, henceforth). The inquiry was motivated by four factors, namely: the need to (i) document the low school enrolment and (or) completion rates in African countries, (ii) shed light on the plausibility of government expenditure in addressing the human capital deficits which ostensibly explains the growth differentials of African region relative to other regions, (iii) find out which level of education takes priority on the government education spending list and the corresponding implications and (iv) fill the gap in the extant literature regarding studies that control for governance variables in assessing the effects of government education spending on educational outcomes in SSA.

First, recent statistics of education in African countries indicate evidence of low enrolment and completion rates for all levels of education (Barro and Lee, 2016; World Bank, 2020). Over the periods of 2000 and 2019, the average level of school enrolments in SSA stood at 97% for primary, 35% for secondary, and 6% for tertiary education (for brevity, the chronology is maintained) (World Bank, 2020). Likewise, the school completion rate between 2000 and 2016 stood at an average rate of 16.77% for primary education, 9.7% for secondary education, and 1.53% for tertiary education. For the same periods, the average years of school completed was 3.37% for primary education, 1.27% for secondary education, and 0.08% for tertiary education (Barro and Lee, 2016)¹. These figures might explain the high rate of out-of-school children, child labour, crime rate, and other social vices in SSA, which undermine the stock of human capital in the region.

Second, government expenditure has been recognized as an essential tool of economic stabilization policy (Ogbu and Gallagher, 1991; Anyanwu and Erhijakpor, 2007). Government spending on education is often justified based on its positive correlation with outcomes such as an individual's lifetime income and general social rate of return (Psacharopoulos 1994). Many empirical macroeconomists had equally identified human capital differentials as the primary explanation for differences in growth rates around the world (Solow, 1957; Barro and Xavier, 1995). This perhaps explains the marginal increase in the ratio of government spending on education as a percentage of total government expenditure in SSA from 15.60% in 2000 to 16.19% in 2013 and then 17.88% in 2018 (World Bank, 2020).

¹ New data set of educational attainment in the world, 1950-2010, NBER Working Paper No. 15902.

Third, the direction of government education spending, in terms of the priority given to each level of education, influences the overall returns to education because changes in government spending are usually correlated with contemporaneous economic shocks (Evans and Ghosh, 2008; Kraay, 2012; Jackson, et al., 2016). The Africa Economic Outlook (2020) Report noted that, although African countries are allocating huge resources to education, the region has the lowest education spending efficiency. The Report further stated that Africa has a 58 percent efficiency score for primary education, 41 percent efficiency for secondary education, and a lower tertiary education percentage.

Fourth, there is an ongoing debate in the literature on the impact of government education spending on educational outcomes and why developing countries have a low human capital development index (Case and Deaton, 1999; Craigwell, et al., 2012; Jackson, et al., 2016). Other contemporary education literature sought to provide empirical evidence to the education production function in country-specific or cross-sectional analysis. (Coleman, 2006, Harris, 2010; Hanushic, 2020). However, little attention has been paid to how governance structure could change the narratives about government education spending effectiveness. This gap underscores the empirical relevance of this research.

To position the research for more policy relevance and in line with recent studies such as Asongu, and Odhiambo, (2019); Asongu, et al. (2020), we considered the net effect of government spending on education. This involved exploring how composite governance indicators influence the impact of government education expenditure on the level of educational outcomes. From a theoretical perspective, the basic education production function, an offshoot of the neoclassical economic growth models, provides the theoretical anchor for the link between government education expenditure and educational outcomes (Harris, 2010; Hanuseck, 2020). As such, this research presents an empirical verification of the framework based on SSA regional specific characteristics.

The rest of the paper is summarized thus: after the introductory section, section two discusses the background issues, while section three provides the theoretical anchor and empirical evidence. The data and methodology are discussed in section four, while section five presents the result, and section six presents the conclusion and policy recommendations.

2. Background Issues

In this section, we discuss some background issues about government education expenditure and educational outcomes in sub-Saharan Africa to have a robust empirical background of the two concepts in the continent. Table 1 presents the educational attainment in Africa compared to the rest of the world using the average values from 2000-2016. The table essentially shows the completion rate at each level of education and the average years of schools completed for each of these levels.

As seen in Table 1, Africa has the lowest primary school attainment, with a completion rate of 16.77%. This is below the world average of 16.88%. Besides, it is seen that Africa also has the lowest secondary school attainment with a completion rate of 9.17%, which comes far behind the least developed countries (LDCs) completion rate of 20.68%. The trend continues for the level of tertiary school attainment, with Africa having a completion rate of 1.53% compared to 5.95% tertiary school completion rate of LDCs. This low level of aggregate completion rate for the various levels of education could be best explained by most African countries' inability to contend with major social and developmental issues such as poverty, child labour, access to education, out-of-school children, etc. (Case and Deaton, 1999). The table also shows the average years of each level of school completed. Africa again fell below other regions at all the average years of primary school, tertiary school, and tertiary school education.

Table 1: Educational Attainment in Africa between 2000-2016 (average values)

Regions	Primary school Attainment	Secondary school Attainment	Tertiary school Attainment
	Completion Rate (%)	Completion Rate (%)	Completion Rate (%)
Africa (including sub-Saharan Africa)	16.77	9.17	1.53
Least Developed Countries (LDCs)	17.88	20.68	5.95
East Asia and Pacific	20.31	24.31	6.85
The World	16.88	22.77	7.47
	Average Years of School Completed	Average Years of School Completed	Average Years of School Completed
Africa (including sub-Saharan Africa)	3.37	1.27	0.08
Least Developed Countries (LDCs)	4.4	2.39	0.31
East Asia and Pacific	4.63	2.62	0.37
The World	4.58	2.54	0.39

Source: Barro and Lee (2016)

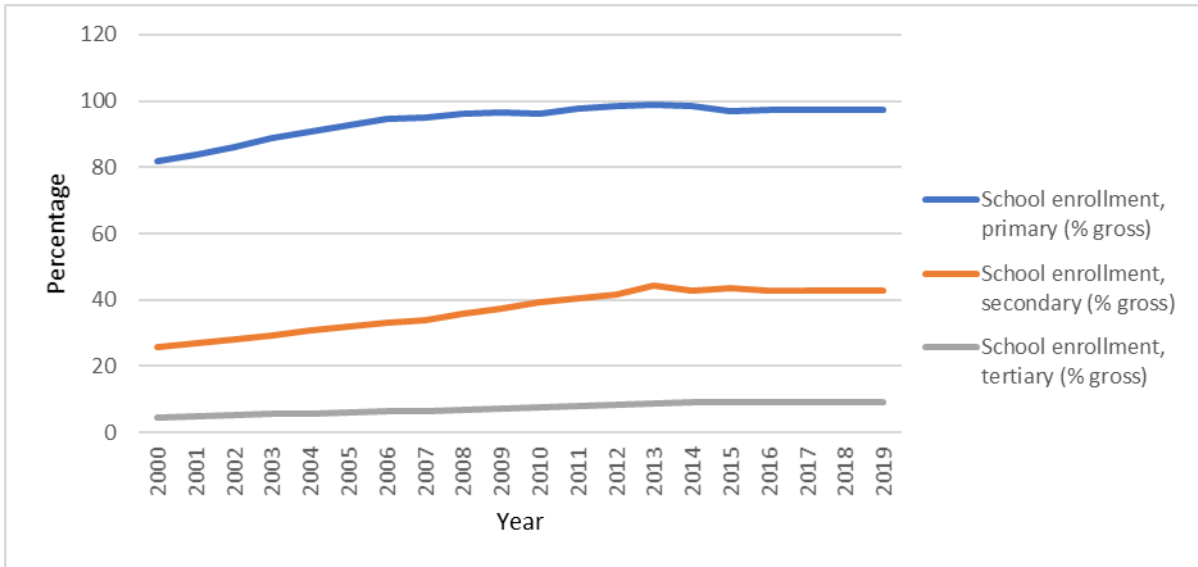


Figure 1: Enrolment Rates in sub-Saharan Africa (%)

Source: World Development Indicator, (2020)

Figure 1 shows the enrolment rate for the different levels of education in the sub-Saharan African countries for 2000 - 2019. The average primary school enrolment stands at 92% during the period, while the average secondary school enrolment rate was 35%, and the average tertiary school enrolment was 6%. This implies that enrolment rates declined with the level of education. This suggests that the bulk of human capital development strategy embarked upon by most countries in sub-Saharan Africa focused on basic education.

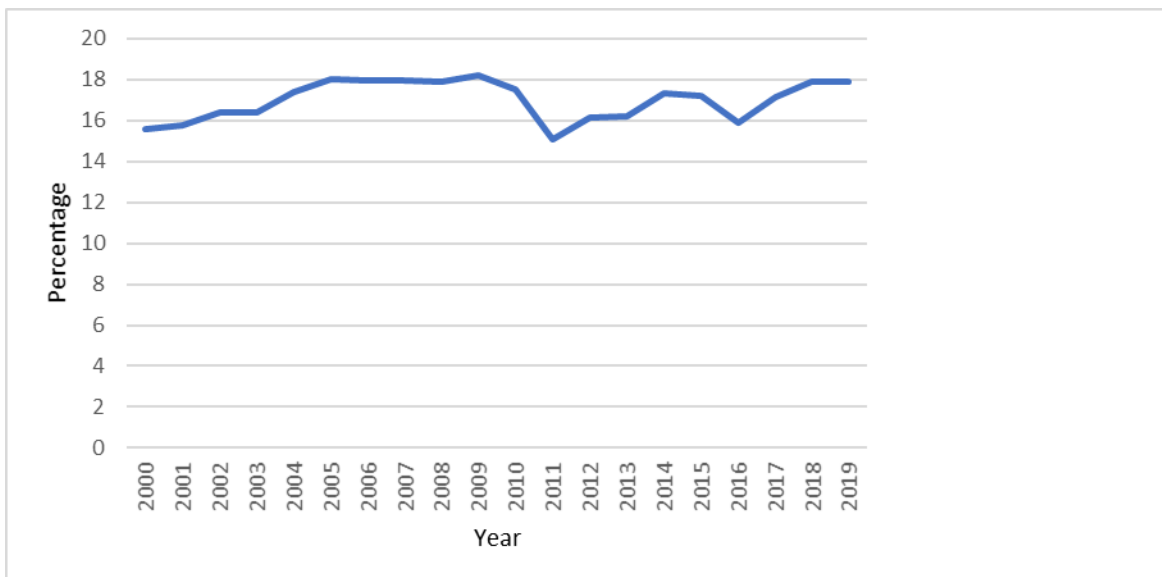


Figure 2: Government expenditure on education, total (% of government expenditure)

Source: World Development Indicator, (2020)

Figure 2 depicts the percentage of government expenditure on education as a percentage of total government expenditure in SSA for 2000-2019. From Figure 2, it is seen that about 17.01% of total government spending was spent on education in the continent. Despite the priority allotted to the education sector, the evidence is inconclusive on the impact of government spending on education outcome. With the human capital deficiencies in the region, Asongu and Odhiambo, (2019), and Asongue, et al. (2020) provided preliminary evidence that shows that weak governance in SSA contributes to the observed low level of human capital development in the continent. The weak governance, which is reflected in weak institutional structures, low social capital, lack of the rule of law as well as the lack of accountability on the part of government officials in the continent, has undermined most of the government expenditure policies. These anomalies have weakened transmission channels and the linkage between government education expenditure and educational outcomes in sub-Saharan African countries.

3. Theoretical Anchor and Empirical Evidence

The theoretical anchor for this research is predicated on the education production function (EPF, henceforth) derived from the neoclassical growth theory. (Solow, 1957; Barro and Xavier, 1995). The basic EPF is a framework that relates various composite inputs of education (such as funding, peers, family, and school) to the highest obtainable level of student achievement, in this case, educational outcomes (Harris, 2010). In examining the framework of a typical EPF, we relate various factor inputs derived from education theory (Coleman, 1966) and evidence (Rothstem, 2004). We further considered how different variations in factor inputs influence educational outcomes. Thus, taking a cue from the framework of Hanushek (2020), an abridged EPF can be specified.

Assume that an educational outcome for an individual student i at time t is defined as O_{it} which is a function $g(.)$ of school input M and family input F from all current and previous periods, a fixed student contribution K_i and an error term u_t ; the basic EPF can be specified as:

$$O_{it} = g(M_{it}, M_{t-1}, \dots, F_{it}, F_{it-1}, \dots, K_i, u_{it}) \quad (1)$$

Equation (1) shows the combination of factor inputs in a production framework that determines a student's school outcome. However, if these inputs (assumptions) are altered, variants of equation (1) are possible. For instance, with the assumption of additive

separability, the EPF is additively separable such that the effects of inputs do not interact with one another². Such assumption would yield,

$$O_{it} = \rho_1 M_{it} + \rho_2 M_{it-1} + \dots + K_i + u_{it} \quad (2)$$

In equation (2), ρ represents the sets of contributions given by current and present school inputs. This shows the marginal effect of inputs, i.e., the change in output associated with a marginal change in inputs. In another parlance, if we account for the effects of all prior school inputs which decline geometrically with the time between the application of inputs and that $\rho_2 = \lambda\rho_1$, etc, where λ is some constant, then the new education outcome equation becomes:

$$O_{it} = \rho_1 M_{it} + \lambda O_{it-1} + K_i + \varepsilon_{it} \quad (3)$$

where $\varepsilon_{it} = \mu_{it} - \lambda\mu_{it-1}$. This error term has important implications for the computation of the value-added EPF, which shows the unobserved differences across students and families.

Although the basic EPF has a micro foundation, the knowledge of school production function can be harnessed in a contemporary macroeconomics perspective to assess government spending effectiveness. Since educational outcomes cannot be changed by fiat, attention must thus be paid to the inputs side of the school production function, especially on education policy relating to funding, school, and teachers' quality, etc. (Hanushek, 2020).

In terms of evidence, many studies have contributed to the debate on the effect of government spending on education to validate the human capital-based theories of growth empirically. These studies focused on cross country, regional analysis, and country-specific examination of the effectiveness of government education expenditure on educational outcomes such as aggregate enrolment rates, level of educational attainment, and other indicators (Ogbu and Gallagher, 1991; Anyanwu and Erhijakpor, 2007; Bohlmark and Lindahl, 2015). The results of these empirical studies are however, mixed.

Starting with studies that focused on the need for government to allocate more resources to education, Ogbu and Gallagher (1991) investigated the link between public spending and SSA education distribution. They found that public expenditure on education is enhanced by reallocating funds and striking a balance between capital and recurrent expenditure. This line of research was the focus of Hanushek (2013). He found that developing nations could only close the school-related gap with developed countries and enhance schools' quality through increased budgetary allocations to the sector. Bohlmark and Lindahl (2015) found that short-

² See Harris, (2010) for complete treaties on education production function and the empirical investigation.

and long-term performance and global competitiveness could only be guaranteed by improved government expenditure to the sector.

Another strand of literature focused on different educational outcomes. Many continue to draw attention to the causal relationship between educational expenditure and school enrolment. However, there is no general agreement on the causality between government expenditure on education outcomes, mostly school enrolment and attainment (Anyanwu, 1998). Most discussions on the impacts of public spending on education often generate conflicting opinions. For example, Card and Krueger (1996), Greenwald et al. (1996), and Krueger (2003) advocate the effectiveness of public education expenditure; Betts (1996) and Hanushek (2003) and Al-Samarrai (2006) cast doubt on the conclusion of public education expenditure.

Specifically, Anyanwu and Erhijakpor (2007) analyzed the connection between government spending on educational enrolment and found that public spending on education has a substantial effect on enrolment rates among the SANE countries. Gyimah-Brempong (2011) found that secondary education was necessary for few development outcomes, while tertiary education was essential for human capital development and growth rates. Other writers explored the health results of education and discovered that schooling tends to benefit health results in general (Silles, 2009; Kabubo-Mariara et al., 2009, among others). This could be because educated individuals have better information about solutions to health or because of the options accessible to them to make better health choices. For instance, Glick et al. (2009) found that Madagascar-educated individuals were less likely to be misinformed about HIV.

As a follow up to the Report of Coleman, et al. (1966) on public school funding advocacies, Jackson, et al. (2015) investigated the effects of school spending on educational outcomes in the U.S. and found that governance element (such as school finance reforms), moderated the link between school spending and educational outcomes in the country. This finding corroborates the notion in the governance literature (Asongu, et al 2019; Asongu, et al, 2016), that institution and economic governance variables such as government effectiveness and the rule of law moderate the effect of public-school spending on student outcomes.

Case and Deaton (1999) investigated the link between school inputs and educational outcomes in South Africa. After controlling for the effects of political governance, such as voice and accountability, most especially in the White and Black dichotomy under apartheid, the study found that school inputs had a significant and robust effect on educational outcomes such as enrolment and attainment rates.

In assessing the effectiveness of government expenditure on education and health in the Caribbeans, Cowell, et al. (2012) found that government spending did not have any meaningful impact on primary and secondary enrolments. The study, thus, recommended strengthening the institutional governance, most especially the control of corruption, to increase the effectiveness of government education expenditure on education outcomes in the country.

An interesting argument in the literature is the analysis of the two strands of government expenditure. Some studies disaggregated government expenditure into recurrent and capital expenditure to specifically account for the effect of each on education in empirical analyses (Urama, et al, 2018; Ifionu and Nteegah, 2013; Gylych; Modupe and Semiha, 2012; Odeleye, 2012). Due to nature and time horizon, these expenditure components' effects differ significantly compared to the total expenditure. In a country-specific study, Gylych, Modupe, and Semiha (2012) empirically documented the disaggregated analysis of government education expenditure on economic growth. Government recurrent education expenditure was reported to have a positive impact while government capital expenditure was negative. In related works, Urama, et al. (2018) found that both capital and recurrent government education expenditure had positive and significant impacts on economic growth. However, the disaggregated analysis of government education expenditure into its two components requires data availability. In the absence of a disaggregated dataset, especially, as the case with most cross-sectional or panel studies, the analysis of government education expenditure could be based on the net effect.

From the foregoing, empirical literature identified governance's role in assessing the link between government education spending and educational outcomes. (Coleman, et al., 1966; Cowell, et al., 2012; Jackson, et al., 2015). However, such empirical researches on sub-Saharan Africa are still scant in the literature. This leaves a wide gap in the empirical inquiries on SSA in terms of studies that account for governance variables' moderating effect while examining the correlation between government education spending and educational outcomes. Hence, the need for this research.

4. Data and Methodology

4.1 Data

This study employed panel data, and the samples consist of 31 Sub-Saharan African

countries³ from 2000-2019. The scope is, on the one hand, driven by data availability and, on the other hand, driven by the constraints imposed by the methodology adopted for the study. Major data requirements for the adoption of the generalized method of moments (GMM) include: data must (i) come from different groups (n) which are collected over time (t), (ii) have adequate degrees of freedom and avoid over-identification problem, (iii) have a large number of individuals (n) and a small period of time (t), such that $n > t$ (Labra and Torrecillas, 2018).

Congruent on one of the motivations of this study, three levels of school enrolment rates are adopted as measures of educational outcomes, namely, primary, secondary, and tertiary school enrolment rates (Evans and Ghosh, 2008). School enrolment measures the total number of students in the theoretical age group for a given level of education enrolled, expressed as a percentage of the total population in that age group. The choice of three levels of school enrolment rates as measures of educational outcomes was based on two reasons. First, data on other measures of educational outcomes such as educational attainment are mostly missing for African countries. Second, the use of the three measures of educational outcomes is expected to show the priority and direction of government education spending in sub-Saharan African countries.

Government expenditure on education is measured as the total amount spent by the government on education over a specific period of time. This main explanatory variable shows the composition of government spending as a percentage of GDP and emphasises government attention to priority sectors. The control variables used in this study include real GDP per capita, inflation rate, and governance. Governance is measured using government effectiveness, the rule of law, voice & accountability, and control of corruption. Governance, for instance, is positively correlated with the execution and disbursement of budgetary allocations. In this study, we argue that a weak governance structure in African countries constitutes a hindrance to the overall effectiveness of government expenditure. Government expenditure would fail to reflect its actual opportunity costs where there is weak system, as it allows rent-seeking behaviour and other corrupt practices to thrive. This, therefore, implies that an improvement in governance is expected to have a positive effect on the link between government spending on education and educational outcomes.

³ Benin, Burkina Faso, Burundi, Cabo Verde, Cameroon, Congo, Dem. Rep., Congo, Rep., Cote d'Ivoire, Eswatini, Ethiopia, Gambia, The, Ghana, Guinea, Kenya, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Niger, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, South Africa, Tanzania, Togo and Uganda.

Data for school enrolment rates, government education expenditure, real GDP per capita, and inflation rates are sourced from the World Development Indicators, while governance datasets are sourced from World Governance Indicators. Appendix A presents the summary statistics, while the correlation analysis is presented in Appendix B.

4.2 Methodology

4.2.1 Specification

Modelling the nexus of government expenditure and education outcomes can be achieved through different channels as established in the literature. In this study, the requisite model to estimate the effect of government education expenditure on educational outcomes is based on a system GMM process specified in equations (4) and (5):

$$EOT_{i,t} = \gamma_0 + \gamma_1 EOT_{i,t-\delta} + \gamma_2 GSP_{i,t} + \sum_{n=1}^3 \alpha_n Z_{n,i,t-\delta} + K_i + \mu_{i,t} \quad (4)$$

$$EOT_{i,t} - EOT_{i,t-\delta} = \gamma_1 (EOT_{i,t-\delta} - EOT_{i,t-2\delta}) + \gamma_2 (GSP_{i,t} - GSP_{i,t-\delta}) + \sum_{n=1}^3 \alpha_n (Z_{n,i,t-\delta} - Z_{n,i,t-2\delta}) + (K_i - K_{i-\delta}) + (\mu_{i,t} + \mu_{i,t-1}) \quad (5)$$

where, $EOT_{i,t}$ is education outcomes (i.e., school enrolment rates) of country i in period t , γ_0 is a constant. $GSP_{i,t}$ government education expenditure as a share of GDP⁴ of country i in period t . Also, Z is the vector of control variables (real GDP per capita, inflation, and governance). K_i is the country-specific fixed effect and $\mu_{i,t}$ is the error term. For a robust analysis, most especially to calculate the net effect, we interacted government education expenditure with governance variables {including government effectiveness (GE), the rule of law (ROL), voice & accountability (V&A), and control of corruption (COC)}. This yielded "GSP" x "GE", "GSP" x "ROL", "GSP" x "V&A" and "GSP x COC" respectively.

This study applied the two-step System GMM estimation technique developed by Arellano and Bond (1991) and Blundell and Bond (1998). This estimation technique becomes desirable for two reasons. First, there is the possibility of an endogeneity problem arising from reverse causality between government spending on education and educational outcomes. This is possible because an improvement in educational outcomes might lead to an increase in government educational spending. Second, the method offers reliable estimates when the models to be estimated possess features such as small time periods relative to the

⁴ Given that the analysis was done at different level of education, the most appropriate measure of government spending on education ought to be at the different level of education. The shortage of data at that level informed our decision to use aggregate government spending on education.

number of cross-sections, include the lagged dependent variable, have endogenous issues, or uses data that are prone to measurement errors, which succinctly summarise the properties of the data used in this study.

To validate the reliability and robustness of the estimated models, the fundamental information criteria used are AR(1), AR(2), Sargent test, Hansen test, and Wald (Joint) test. These test statistics presented in Tables 1-3 confirm the reliability of the instruments and estimation approach used. The study used the lagged of the explanatory variables as the instrument.

4.2.2 Identification, Simultaneity and Exclusion Restrictions

As a prerequisite for a robust GMM specification, there is a need to clarify the concerns about identification, simultaneity, and exclusion restrictions (Roodman, 2009). This would further justify the appropriateness of the GMM methodology in accordance with recent extant empirical literature (Asongu, et al, 2016; Asongu, et al. 2020). The identification process involves the strict classification of the outcome, endogenous and strictly exogenous variables, while solving the issue of simultaneity involves using lagged regressors as instruments for forward-differenced indicators (Asongu and Odhiambo, 2019). As argued by Roodman (2009), the identified strictly exogenous variables are not likely to be endogenous upon a first difference. Based on the data for this research, years represent the strict exogenous variables while control variables are real GDP per capita, inflation, and governance. The independent variable is government expenditure on education. To ensure this, the *gmmstyle* is therefore adopted for endogenous variables while *iv(years, eq(diff))* is employed for treating instrumental variable (*iv* or *ivstyle*).

However, we used the *robust* style to avoid over-instrumentation, since, by the rule of thumb, the number of instruments must be lower than the number of groups. In two-step estimation, the standard covariance matrix is already robust in theory; but typically yields standard errors that are downward biased—the two-step robust requests Windmeijer's finite-sample correction for the two-step covariance matrix (Roodman, 2009). In a nutshell, the clarification of the identification, simultaneity, and exclusion restrictions concerns suffices to verify the validity of the GMM approach used in this research. Failure to do this might lead to generating unreliable estimates from which inaccurate inferences might be made.

5.0 Empirical Results

5.1 Presentation of Results

Tables 3-5 present the empirical results of the effect of government education spending on primary, secondary, and tertiary school enrolment rates, respectively. In generating these results, two models were specified and analyzed; one with inflation and the other without inflation. This was done to (i) specifically control for the inflationary effect of government spending and, (ii) depict that changes in government spending are often correlated with contemporaneous macroeconomic shocks (Kraay, 2012). The results of the models with inflation generated mostly insignificant estimates for all the levels of education⁵. This shows that price movements offset government spending on education in the region and reiterates the need for African countries to institute strong price stabilization policies. Consequently, further interpretation is limited to the estimates generated from the models without inflation. Following interaction regressions-based literature, we interacted government education expenditure on governance variables (i.e., government effectiveness, the rule of law, voice & accountability, and control of corruption). After that, the net effects arising from the conditional and unconditional impact of government education expenditure on education outcomes were computed (Asongu and Odhiambo, 2019). The motivation was to assess the mechanisms through which government expenditure on education affects educational outcomes in SSA.

Table 2: Summary of Results of the link between Government Education Expenditure and Educational Outcomes in sub-Saharan Africa.

Variables	Primary Enrolment Rate	Secondary Enrolment Rate	Tertiary Enrolment Rate
govexp	✓	✓	X
lgdppc	X	✓	X
govteff (GE)	✓	X	X
rulelaw (ROL)	✓	X	X
voiceacct (V&A)	✓	X	X
concor (COC)	X	X	X
govexp x GE	✓	✓	✓
govexp x ROL	✓	✓	✓
govexp x V&A	✓	X	✓
govexp x COC	X	✓	✓

Source: Authors' Compilation

Note: ✓ Signifies that relationship exists while X signifies that no relationship exists.

⁵ The insignificant results of the models with inflation were reported to avoid publication bias articulated in Franco et al (2014). However, for brevity and to avoid overtly repetitive orientation, the results generated from the models without inflation are not presented.

Tables 2 shows the summary of the results of the link between government education expenditure and educational outcomes in sub-Saharan Africa. As the table depicts, government education spending in Africa mainly focuses on primary and secondary education to the detriment of tertiary education. This is ostensibly driven by the fact that such spending policy is convenient and it generates political gains. Due to institutional rigidities, which dates from her governance structure, higher education in Africa is less responsive to the changes in global knowledge and labour market demands. Other consequences of this disproportional public education spending policy include brain drain, less global competitiveness, and inadequate skill match to accelerate the region's growth and development (Devarajan, et al, 2011).

5.2 Government Expenditure, Educational Outcomes and Government Priority in SSA

Table 3 presents the effects of government education expenditure on primary enrolment rates. The results from column (1) show that government education expenditure is positively related to the primary enrolment rates. To put this result in perspective, African governments concentrate on primary education because its social rate of returns outweighs the private rate of returns. Primary education equips people with basic knowledge, skills, attitude, and values which make them functional members of society and enable them to pursue relevance in life. This informs the special intervention programmes in that level of education. Also, the main drive to maintain a high level of net enrolment in SSA is to close the relatively slow schooling gaps in the continent. An increase in the stock of human capital is expected to reduce the menace of the high rate of out-of-school children and develop the human capital required for development in the continent (Arthur and Oaikhenan, 2017).

Table 3: Effect of Government Education expenditure on Primary Enrolment rate

Dependent Variable = Primary Enrolment Rate (% of gross)					
	(1)	(2)	(3)	(4)	(5)
L.penrl	0.810*** (0.052)	0.786*** (0.061)	0.783*** (0.065)	0.772*** (0.068)	0.762*** (0.068)
govexp	0.897** (0.358)	0.966** (0.438)	0.990** (0.470)	1.078** (0.465)	1.071** (0.494)
lgdppc	-0.240 (0.434)	-0.648 (1.116)	-0.477 (0.958)	-0.160 (0.883)	-0.000 (0.000)
Constant	0.671*** (0.162)	0.795*** (0.164)	0.756*** (0.179)	0.735*** (0.168)	0.870*** (0.321)
govteff (GE)	---	0.041*** (0.015)	---	---	---
rulelaw (ROL)	---	---	0.036*** (0.014)	---	---
voiceacct (V&A)	---	---	---	0.035*** (0.013)	---
concor (COC)	---	---	---	---	-0.003 (0.008)
govexp x GE	---	0.008*** (0.003)	---	---	---
govexp x ROL	---	---	-0.007** (0.004)	---	---
govexp x V&A	---	---	---	-0.008** (0.004)	---
govexp x COC	---	---	---	---	0.002 (0.010)
Time Effect.	YES	YES	YES	YES	YES
Net Effect	na	2.620	-0.436	-0.552	na
AR(1)	0.066	0.073	0.075	0.079	0.079
AR(2)	0.155	0.527	0.510	0.503	0.504
Sargan (OIR)	0.422	0.000	0.000	0.000	0.000
Hansen (OIR)	0.619	0.539	0.536	0.500	0.465
Wald (Joint)	7907*** (0.000)	4023*** (0.000)	3730*** (0.000)	3552*** (0.000)	7694*** (0.000)
Instruments	23	23	23	23	22
Countries	31	31	31	31	31
Observations	251	333	333	333	333

Standard errors are in parenthesis

*** p<0.01, ** p<0.05, * p<0.1

Based on autocorrelation test, Arellano and Bond GMM estimator is valid if the null hypothesis for AR(1) is rejected and the null hypothesis for AR(2) is not rejected. The validity of the instruments is tested by Sargan and Hansen Over-identifying Restriction (OIR) tests. Constants are included in all the regressions.

In addition, we compared this result with what was obtained when we accounted for the control variables that might affect government expenditure. Findings showed that the effects of government education expenditure remain unaffected by controlling for real GDP per capita and governance level in the continent. Results show that real GDP per capita had an insignificant effect on the primary enrolment ratio. While improvement in the performance of

basic macroeconomic variables helps allocate economic resources to important sectors, the results show that government expenditure on primary education seems to be autonomously determined in the African countries. This substantiates the attention of the government to that lower rung of education.

We thereafter examined the conditional impact of government spending on education on the enrolment ratio in primary school through the level of governance. Our results, including both governance and the interactive term of government spending and governance, show that the coefficient of governance is positive, whereas the interactive effect is negative. These results hold except for one measure of governance used in the study.

The positive sign of governance indicates that improvement in the quality of the institutions in the continent will play a crucial role in ensuring that the amount disbursed for education is used as planned, thereby increasing the educational outcome, i.e., primary enrolment rate. Furthermore, the interactive term's negative coefficient indicates that given the level of governance, an increase in government expenditure leads to lower primary enrolment rates, except for government efficiency, which showed otherwise.

However, by computing the net effect, we observed that an increase in government spending, despite the reducing effect of governance, on average, contributed to an increase in the primary enrolment ratio. For instance, the net effect for government effectiveness is 2.620 ($2*[101.88*0.008] + 0.996$). This implies that, by excluding the level of governance in the continent, the effect of government spending on education is overestimated, but the overall effect remains positive.

Our findings are inconsistent with the findings in Glewwe et al., (2010) and Craigwell (2012) on the effect of government spending on educational outcomes. For instance, Craigwell (2012) confirmed that government spending had no significant impact on primary enrolment rates in the Caribbean. Our findings are consistent with Arthur and Oaikhenan (2017), which quipped that public funding had better effects on educational outcomes using data for developed countries. Hence, the direction of the impact might have been driven by country-specific factors. This could be due to poor governance structure in developing countries which often crowds out the larger effect of government spending.

Table 4: Effect of Government Education expenditure on Secondary Enrolment rate

Dependent Variable = Secondary Enrolment Rate (% of gross)					
Model without Inflation					
	(1)	(2)	(3)	(4)	(5)
L.senrl	0.835*** (0.070)	0.822*** (0.081)	0.820*** (0.073)	0.827*** (0.074)	0.825*** (0.073)
govexp	0.061** (0.032)	0.065** (0.035)	0.067** (0.034)	0.063** (0.032)	0.061** (0.033)
lgdppc	0.049** (0.025)	0.062** (0.036)	0.061** (0.031)	0.051** (0.027)	0.051** (0.028)
_cons	0.214*** (0.073)	0.153*** (0.104)	0.168*** (0.101)	0.218*** (0.084)	0.240*** (0.079)
govteff (GE)	---	-0.023 (0.022)	---	---	---
rulelaw (ROL)	---	---	-0.018 (0.019)	---	---
voiceacct (V&A)	---	---	---	-0.003 (0.010)	---
concor (COC)	---	---	---	---	0.003 (0.015)
govexp x GE	---	0.003*** (0.001)	---	---	---
govexp x ROL	---	---	0.002** (0.003)	---	---
govexp x V&A	---	---	---	0.021 (0.010)	---
govexp x COC	---	---	---	---	-0.021** (0.010)
Time Effect.	YES	YES	YES	YES	YES
Net Effect	Na	0.351	0.258	na	-0.130
AR(1)	0.061	0.065	0.066	0.066	0.066
AR(2)	0.169	0.168	0.170	0.168	0.168
Sargan (OIR)	0.008	0.002	0.005	0.007	0.001
Hansen (OIR)	0.668	0.717	0.736	0.707	0.707
Wald (Joint)	3092*** (0.000)	3012*** (0.000)	3029*** (0.000)	3351*** (0.000)	3253*** (0.000)
Instruments	22	23	23	23	23
Countries	29	29	29	29	29
Observations	253	239	239	239	239

Standard errors are in parenthesis

*** p<0.01, ** p<0.05, * p<0.1

Based on autocorrelation test, Arellano and Bond GMM estimator is valid if the null hypothesis for AR(1) is rejected and the null hypothesis for AR(2) is not rejected. The validity of the instruments is tested by Sargan and Hansen Over-identifying Restriction (OIR) tests. Constants are included in all the regressions.

Table 4 focuses on the effects of government education expenditure on secondary enrolment rates. The results from column (1) show that government education expenditure is positively related to secondary enrolment rates. In comparison, findings showed that the effects of government education expenditure remain unaffected after controlling for real GDP per capita and governance level in the continent.

The results show that real GDP per capita had a positive and significant effect on the secondary enrolment ratio. Thus, increase economic growth leads to an improvement in educational outcomes. This suggests that the secondary school enrolment rate responds to prevailing economic conditions in the African countries. That is, better fiscal and macroeconomic performances enhance the allocation of economic resources to priority sectors. Per capita public expenditure is a tool for accessing the quality of aggregate government expenditure. This result supports the findings of Hanushek (2013) that economic growth is a driver of human capital development.

The conditional impact of government education spending on secondary enrolment rates through governance level was also examined. Findings show that governance variables have insignificant effects on secondary enrolment rates while the interactive term of government spending and governance has significant interactive effects. This holds except for one measure of governance. The insignificance effects of governance on secondary enrolment rates imply that less attention (compared to primary education) is devoted to that rung of education by the governments in African countries. That is, secondary enrolment rates in SSA are insensitive to the governance structure, which is possibly due to the involvement of more private stakeholders in that level of education.

Given the level of governance, the interactive term indicates that an increase in government expenditure leads to an increase in the level of secondary enrolment rates, but when interacted with control of corruption, the result was different. After computing the net effect, it was revealed that an increase in government spending, nonetheless the effect of governance, increased the secondary enrolment ratio. For instance, the net effect for government effectiveness was $0.351 (2*[47.76*0.003] + 0.065)$. By implication, aside from the governance variables, the effect of government spending on educational outcomes in terms of secondary enrolment rates is underestimated.

Apparently, the limited effect of government funding on secondary education, as compared to primary education, has affected the quality of input into higher education. This partly explains the low quality of graduate turnout in African higher institutions. In Table 5, the results showing the effects of government education expenditure on tertiary enrolment rates are presented. From column (1), findings revealed that government education expenditure did not have any significant effect on tertiary enrolment rates in the continent. This explains why higher education in Africa remains less competitive in the global marketplace.

Table 5: Effect of Government Education expenditure on Tertiary Enrolment rate

Dependent Variable = Tertiary Enrolment Rate (% of gross)					
Model without Inflation					
	(1)	(2)	(3)	(4)	(5)
L.tenrl	1.008*** (0.063)	1.028*** (0.044)	1.018*** (0.041)	1.025*** (0.048)	1.038*** (0.045)
govexp	0.064 (0.039)	0.254** (0.135)	0.256** (0.112)	0.207** (0.122)	0.184* (0.117)
lgdppc	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
_cons	-0.085 (0.206)	0.025*** (0.381)	0.064** (0.298)	-0.124** (0.341)	0.038*** (0.302)
govteff (GE)	---	0.279 (0.258)	---	---	---
rulelaw (ROL)	---	---	0.325 (0.211)	---	---
voiceacct (V&A)	---	---	---	0.242 (0.221)	---
concor (COC)	---	---	---	---	0.281 (0.200)
govexp x GE	---	0.020*** (0.002)	---	---	---
govexp x ROL	---	---	0.032*** (0.007)	---	---
govexp x V&A	---	---	---	-0.011** (0.006)	---
govexp x COC	---	---	---	---	-0.200** (0.061)
Time Effect.	YES	YES	YES	YES	YES
Net Effect	na	0.562	0.748	0.038	-2.892
AR(1)	0.043	0.047	0.045	0.046	0.044
AR(2)	0.302	0.294	0.390	0.190	0.288
Sargan (OIR)	0.000	0.000	0.000	0.000	0.000
Hansen (OIR)	0.476	0.508	0.538	0.563	0.610
Wald (Joint)	8744*** (0.000)	4945*** (0.000)	6516*** (0.000)	5524*** (0.000)	3249*** (0.000)
Instruments	21	22	22	22	22
Countries	30	30	30	30	30
Observations	236	225	225	225	225

Standard errors are in parenthesis

*** p<0.01, ** p<0.05, * p<0.1

Based on autocorrelation test, Arellano and Bond GMM estimator is valid if the null hypothesis for AR(1) is rejected and the null hypothesis for AR(2) is not rejected. The validity of the instruments is tested by Sargan and Hansen Over-identifying Restriction (OIR) tests. Constants included in all the regressions.

After accounting for the control variables, the effects of government education expenditure on tertiary school enrolment rates became positive and significant. Although findings revealed that real GDP per capita and governance variables had no significant effects on

tertiary enrolment ratio, the interactive term of government spending and governance was significant for all the measures of governance used in the study.

The interactive term's coefficients indicate that, given the level of governance, an increase in government expenditure had a significant effect on educational outcomes (tertiary enrolment rates), albeit the direction differs with each measure of governance used in the study. The net effect further showed that an increase in government spending, despite the effect of governance variables, led to an increase in the tertiary enrolment ratio. For instance, the net effect for government effectiveness is $0.562 (2*[7.69*0.020] + 0.254)$. This shows that the total effect of government spending on tertiary education might have been understated.

The implications of this result are somewhat reflective. The insignificant effect of government spending on higher education, that is, enrolment rates, could ostensibly be based on two factors; the difficult entry requirement and the dominant private sector involvement. These factors affect the structure of this rung of education and make standardization difficult. As asserted by Devarajan, et al., (2011), higher education in sub-Saharan Africa is dominated by private sector stakeholders as most of the universities operating in the region are privately funded. To break-even, therefore, these institutions charge exorbitant fees which may be difficult for many to afford. The consequence of this is low enrolment, poor research funding, despicable infrastructure, rigid and non-reflective curriculum, etc. In contrast, however, the findings of Jackson, et al (2016) for the United States showed that public funding plays a critical role in boosting higher education. This is perhaps due to the governance structure in the country, which allows allocative efficiency and made it possible for every resource to reflect its real opportunity costs.

6.0 Conclusion and Policy Implications

This article performed an econometric analysis of the impact of government education expenditure on educational outcomes in selected sub-Saharan African countries. This analysis aims to provide new empirical evidence of the effect of government education spending on education outcomes in the continent. This study is essential due to the sundry human capital deficiencies which had affected the level of development in the region. To achieve this objective, the study used panel data consisting of 31 sub-Saharan African countries over the period of 2000 to 2019. This scope was driven by data availability and the constraints imposed by the system GMM methodology adopted for the study. Government education

expenditure was measured by government expenditure on education as a percentage of GDP. Also, this study examined educational outcomes across the three levels of education, namely primary, secondary and tertiary enrolment rates.

Findings from the empirical analysis showed that the effects of government education spending on educational outcomes in SSA were driven by the measure of educational outcome used. Precisely, government education expenditure has a significant impact on primary and secondary enrolment rates but insignificant effects on tertiary enrolment rates in African countries. The result becomes robust after including control variables that tend to have country-specific characteristics. These results confirm the findings of Evans and Ghosh (2008) that governments in the developing world, including the African countries, usually prioritize educational investments in the lower rung of the education ladder.

This study's finding has provided empirical validation on the effect of government education expenditure on educational outcomes. These results, thus, have a lot of policy implications. Government expenditure on education in SSA should be structured to affect all the levels of education more equitably to improve the overall educational outcomes in the region. While basic education may generate some levels of social returns, paying less attention to higher education is a disadvantage to the industrial development of the African region. A balanced approach to government education spending priorities could enhance human capital development indicators in the region.

Also, most countries in sub-Saharan African are still grappling with inadequate access to education. Hence compromises are often made regarding quality, priority, and direction. To increase educational outcomes, therefore, barriers to access to basic education must be removed. Achieving this transcends a standalone approach but a deliberate effort to address issues of out-of-school children, low enrolment and completion rates, child labour, etc. This would include the involvement of private sector participation to rise to the occasion. This would, however, require the provision of an enabling business, investment, and regulatory environment to facilitate meaningful and profitable participation. Also, every institutional and regulatory barrier must be removed to enhance efficient private sector participation.

The study's findings revealed a need to strengthen the governance framework in Africa, which comes with net gains in the education sector. This is crucial because most African countries score low in various governance indexes due to the issues of corruption, human rights abuses etc. To promote the level of governance in SSA, especially as it relates to

achieving better educational outcomes and quality of life, there is a need to improve the capacity of government institutions in order to increase their level of effectiveness and performance. This also includes ensuring that government officials are accountable, transparent, and responsive to their responsibilities. As such, Africa's limited resources could be judiciously used to address the educational challenges confronting the continent. This could be done by ensuring that funds are appropriately channelled towards building the necessary physical infrastructure, which is one of the elements of quality education.

Appendix

Table A1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
penrl	542	101.8832	22.42716	32.35606	149.3075
secenrl	410	44.76441	24.73923	6.19735	109.4441
terenrl	384	7.694937	7.167861	.35198	40.59604
gexp	436	3.916109	1.503576	.62247	10.6779
rgdppc	619	1796.925	2566.225	194.8731	14962.38
inf	599	103.4645	46.83599	6.798738	418.3443
ge	589	-.6281493	.5545531	-1.884151	1.056994
rol	589	-.5689984	.5639174	-2.008507	1.07713
vaa	589	-.4234169	.6766768	-1.733551	.9984295
coc	589	-.5270112	.5463364	-1.548999	.9692127

Table A2: Correlation Matrix

	penrl	secenrl	terenrl	gexp	rgdppc	inf	ge	rol	vaa	coc
penrl	1.0000									
secenrl	0.2871	1.0000								
terenrl	0.1175	0.8128	1.0000							
gexp	0.2497	0.3517	0.1361	1.0000						
rgdppc	0.0635	0.7503	0.6321	0.2089	1.0000					
inf	0.2632	0.1727	0.3525	0.0662	-0.0196	1.0000				
ge	0.0494	0.6214	0.5573	0.2479	0.6597	-0.0434	1.0000			
rol	0.0835	0.6113	0.5214	0.2149	0.5566	0.0099	0.8957	1.000		
vaa	-0.0196	0.5582	0.5259	0.2503	0.4066	0.0253	0.6674	0.7512	1.000	
coc	0.0953	0.6027	0.4347	0.2985	0.5858	-0.0513	0.8295	0.8453	0.6503	1.000

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