RESEARCH PAPER

Empirical Analysis of Fiscal Policy in Sub-Saharan Africa: Is There a Pro-Poor Effect

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Abstract
The study examined the effect of fiscal policy on poverty in a panel of 40 sub-Saharan African countries (SSA) using both the fixed effect (within) IV regression model and a spatial-consistent model to control for the potential spillover effect of poverty. The empirical results show that government spending (captured by public debts, government spending on health and education) is not pro-poor, particularly in SSA's oil-exporting countries. The results may not be unconnected with the high level of corruption in the region. The study also found that government spending (proxied by spending on health and education) does not translate to a reduction in the level of poverty. The results indicate that sub-Saharan African governments should develop human capital by devoting more economic resources to the health and education sectors to meet the 26% (percentage of the total budget) as recommended by UNESCO; and increase the allocation to the health sector to 15% (percentage of total budget) as recommended by WHO.
Keywords: Corruption, Cross-Sectional and Spatial Dependence, Fiscal Policy, Poverty, Pro-poor Economic Growth.
JEL Classification: H2, H5, H6.

1. Introduction
Fiscal policy is the use of government spending/public debt and taxation to influence the economy. According to Keynes (1936), there is a need for government intervention to bring the economy back to equilibrium after an initial

displacement. Traditionally, the justifications for government interventions are the need to reduce private monopolies, externalities, and asymmetric information; provide public goods; provide macroeconomic stabilization; and redistribute income to reduce income inequality and poverty (World Bank, 2015). Thus, governments who have played limited roles since the 1980s and 1990s gradually found themselves back in the business of poverty reduction (Simon, 2012). Consequently, in the last few decades, government spending and debts have increased significantly in sub-Saharan African (SSA, hereafter) countries. In particular, following the COVID-19 outbreak in 2020, governments across the globe, and in SSA in particular, have increased spending to cushion the negative effects of the pandemic.

Stylized Facts
Government Spending and Economic Growth in Sub-Saharan Africa Between 2010 and 2020.

Available evidence shows that government spending in SSA increased from about 90 billion US dollars to over 300 billion US dollars in 2020 (World Bank, 2021), while the total public debts for SSA countries increased from an average of 27 percent (of GDP) in 2010 to over 64 percent in 2020 (Global Database, 2021). In recent times, government stimulus packages have helped to calm turbulent markets, stopped businesses from collapsing, and protected household incomes (see Olaoye, 2022), however, the increase in government spending and/or public debts across SSA coincides with the increase in the rate of poverty in the region. For instance, evidence shows that the number of people living in extreme poverty is on the rise in SSA (see Figure A.1 in the Appendix). Specifically, the data shows that over 200 million people in Africa are trapped in the net of abject poverty (World Poverty Data, 2020). In particular, in the West Africa sub-region, human poverty afflicts about half of the population (Vijayakumar, 2013). Worryingly, forecast estimates also indicate that by 2030, nearly 9 in 10 extremely poor people will live in sub-Saharan Africa.

Poverty in sub-Saharan Africa is also multifaceted - linked with hunger, unemployment, exploitation, and lack of basic social amenities (such as clean water, sanitation, health care, and education). Available evidence shows that the share of multi-dimensionally poor people in SSA is approximately 50 percent

higher compared to strictly monetary indicators (see Woolard, 2002; Vijayakumar, 2013).

The high incidence of poverty across SSA countries may have important implications for Africa's sustainable development agenda. For instance, the high level of poverty in SSA may lead to conflicts and worsen insecurity in the region (World Bank, 2020).

1.1 Measuring Pro-Poor Growth

Alleviating poverty is now a major objective of public policy in developing countries. Historically, the concept of pro-poor growth gained currency in the 1990s (World Development Report, 1990; Whajah et al., 2019). Pro-poor growth implies economic growth should translate to a reduction in the level of poverty. There are two key definitions of pro-poor growth. The first is the absolute concept. According to this concept, growth can only be pro-poor if and only if poor people's average wages increase (Ravallion and Chen, 2003). Secondly, there is the relative definition. The theory of relative economic growth states that economic growth is pro-poor only if poor people's incomes rise faster than non-poor people's – that is, if poverty falls faster than it would if all incomes rose at the same rate (Kakwani and Son, 2003).

Against this background, some fundamental questions arise. Foremost among these is; what is the effect of government spending on poverty reduction in SSA? Others are: what inhibits government spending from achieving the desired economic outcomes? How do governments across SSA reduce poverty in the region?

The study contributes to existing studies in the following ways:

First, unlike most of the previous studies that were focused on economic growth, the study investigates the effect of government spending on poverty in SSA.

Second, the study extends the analysis of poverty literature beyond the narrow definition of poverty in the existing literature by adopting a multi-dimensional approach to poverty.

Third, unlike previous studies (Whajah et al., 2019; Rashid and Intartaglia, 2017) which assume cross-sectional independence, the study accounts for the potential cross-sectional and spatial dependency in poverty and empirical panel

modeling. This is important since poverty may generate spillover effects (see Olaoye and Olomola, 2022).

Fourth, the study controls for aggregate data bias by decomposing government spending data into spending on health and education.

The empirical results show that government spending (captured by public debts) is not pro-poor, particularly in SSA's oil-exporting countries. The results may not be unconnected with the high level of corruption in the region. The study also found that government spending (proxied by spending on health and education) is not pro-poor.

2. Literature Review

2.1 Theoretical Review

There are different theoretical postulations for the prevalence of poverty (see Philip and Miguel, 2015). First is the Keynesian view. This view argues that poverty is largely involuntary and caused by unemployment. The theory therefore emphasizes the role of government in providing employment to eradicate poverty. The second is the classical view. This view posits that poverty is beyond individuals who are ultimately responsible for poverty. This view advocates a limited role for government.

There is also the Marxian/radical view. This view offered that poverty arises as a result of class and group discrimination, and market failures. The Marxists advocate for the intervention of the state and the regulation of markets. They proposed anti-poverty laws such as minimum wage and anti-discrimination laws to eradicate poverty.

2.2 Empirical Review

2.2.1 The Role of Government in Reducing Poverty: An Overview

The World Bank notes that governments should act when inadequate engagement and social practices perpetuate poverty. In contributing to the debate, some scholars (Kabuya, 2011; Chandy, 2015; Stiglitz and Akbar, 2009; UNECA, 2015) have argued that African governments must participate in the markets by establishing the rules of the game that allow markets to work, such as a legal framework that enforces property rights and contracts, as well as maintaining competition and regulating financial markets.

On the empirical front, some authors have attempted to investigate the link between government spending and poverty reduction (see Carter and Chennery, 1979; Addison et al., 2006; Claude Saha, 2008; Ravallion, 2010; Akram, 2016), however, the empirical evidence on the relationship is sparse, largely inconclusive and anecdotal especially in developing and emerging economies. Addison et al. (2006) argued that good fiscal policy can raise economic growth, and growth in turn increases the tax base, thereby, generating the potential for higher public spending on poverty reduction.

Similarly, some scholars (see Byerlee et al., 2005; Diao et al., 2005; 2007; Gupta et al., 2002) examined the impact of government spending on agriculture in reducing poverty. Diao et al. (2005) investigated the potential contribution of government in agriculture to poverty reduction in five selected countries, namely, Ethiopia, Ghana, Rwanda, Uganda, and Zambia. According to the report, broad-based agricultural development, combined with growth in the non-agricultural sector, can significantly contribute to growth and poverty reduction. Similarly, Byerlee et al. (2005) review the contributions of agriculture to pro-poor growth. The authors find that agriculture has played an important and lead role in the early stages of pro-poor growth.

In another study, Gomanee et al. (2003) investigated the hypothesis that pro-poor public expenditure can improve the welfare of the poor in a panel of 39 countries over the period 1980 to 1998. The result shows evidence in support of the pro-poor aid hypothesis. The authors found that 'pro-poor public expenditure is associated with increased levels of welfare.

In a recent study, Whajah et al. (2019) investigated the relationship between government size, public debt, and inclusive growth for a panel of 54 African countries over the period 2000 to 2016. The study finds that, the size of government has a positive effect on inclusive growth, and that public debt hurts inclusive growth. Siburian (2022) examined the link between fiscal decentralization and poverty in Indonesia. The authors found that the implementation of Indonesian fiscal decentralization contributes to poverty reduction.

In a related study, Borrisov and Hashimzade (2022) examined the effect of fiscal policy on wealth inequality. The findings reveal that a fiscal policy with government consumption funded by taxes on labor income and wealth moves the economy from any initial state towards an egalitarian equilibrium with higher aggregate wealth. Bui et al. (2022) investigated the effects of fiscal policy on

households during the COVID-19 pandemic in Thailand and Vietnam. The study found that financial support to households increases citizen's well-being and reduces the level of poverty.

While there have been few attempts (Akram, 2016; Whajah et al., 2019; Siburian, 2022) to evaluate the impact of government spending on poverty, the empirical evidence presented thus far, is limited.

The rest of the paper is organized as follows. Section 3 contains the Conceptual Framework, Data, Theoretical framework, Model specification, and Methodology. Section 4 presents the Empirical Findings, and Section 5 concludes the paper.

3. Theoretical Framework

The study is premised on the Keynesian theory. According to Keynes (1936), poverty occurs unintentionally and is caused mainly by unemployment. Keynes notes that fiscal policy is a major instrument to generate a pattern of growth that engenders poverty reduction. In other words, fiscal policy should foster pro-poor growth. Pro-poor growth implies the poor benefit from the increase in growth rate. Keynes concluded that fiscal policy can be used to create employment, spur economic growth, and ultimately reduce the level of poverty either directly through government spending or indirectly through taxation.
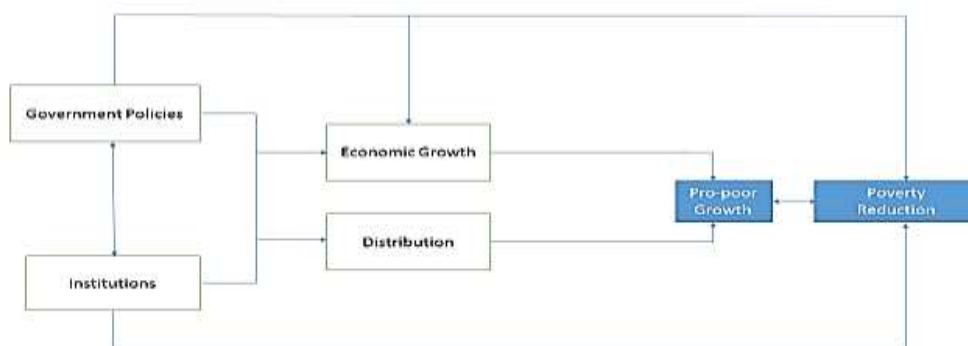
3.1 Conceptual Framework

Figure 1. A Chart Showing the Link between Fiscal Policy and Poverty Reduction
Source: Research finding.

The diagram above illustrates the link between government policies and poverty reduction. The flow chart indicates that government policies and interventions can help to reduce the level of poverty through the channels of economic growth and equitable distribution of wealth.

3.1.1 Data

The study adopts an (unbalanced) panel data set in a sample of 40 SSA countries. This study will make use of annual secondary data culled from the World Development Indicators (WDI), and International Debt Statistics (IDS) covering primarily the period 1990-2018. A vector of dependent variables (the international poverty line of $1.90, the lower and middle-income poverty line of $3.20, the Poverty headcount ratio at $1.90, and the multidimensional poverty measure)) was adopted. However, since the data on poverty is not available in a consistent manner across all countries, the study adopts a 5-year cumulative overlapping, and a 5-year cumulative non-overlapping average model to account for missing data and business cycle phenomenon inherent in macroeconomic panel modeling.

Other variables are government spending on education and health (described as poverty-reducing expenditures in the literature. Another form of government spending adopted in this study is total public debt (proxied by CGD[1]). For a list of all the countries, please see Table A1.

For control variables, the study used: (i) population growth rate; (ii) unemployment rate. This is because the high population growth rate and the unemployment rate in developing countries have been identified in the literature as determinants of poverty (see World Bank Development Report, 1990; Dauda, 2016) (iii) the real interest rate is used to capture the effects of the fiscal-monetary policy mix; (iv) inflation to capture the distributive effect of price on the prevalence of poverty, and (v) institutional quality (measured by control of corruption) since it is established that corruption is the single most important factor militating against growth and development (Olaoye and Aderajo, 2020). For the Measurement of data and sources of key variables, please see Table A3.

3.2 Theoretical Framework, Methodology and Model Specification

The theoretical foundation for this study is the endogenous growth theory. Keynes (1936) pioneered the importance of government interference in a country's

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[1]. Central Government Debt

economic growth and development, which is further emphasized in the exogenous and endogenous growth theories (Barro and Sala-i- Martin, 1992). The authors posit that government spending can affect both the level of product direction and the steady-state growth rate of the economy. Government spending as a public good is introduced into the output function of individual companies by Barro (1990). As a result, the rate of return on private capital rises, stimulating private investment, boosting productivity, and alleviating poverty.

Inspired by Keynes (1936), the importance of government involvement in a country's economic growth and development was emphasized even more in the endogenous growth models (Lucas, 1988; Romer, 1986; Grossman and Helpman, 1991; Romer, 1990). The models recognize that in the Cobb-Douglas development function, it is not only labor and capital stock that lead to a nation's economic growth, but that government also plays an important role in a country's economic prosperity (Barro, 1990; Barro and Sala-i-Martin, 1992; Afonso and Jalles, 2011).

3.2.1 Model Specification

$$y_{it} = \tau y_{i,t-1} + \pi INS_{it} + \theta GEXP_{it} + \vartheta K_{it} + \gamma X_{it} + \eta_i + \varepsilon_{it} \tag{1}$$

where subscript *i* and are the country and time index, respectively, y denotes pro-poor growth (captured by poverty indices (multi-dimensional poverty, extreme poverty, and international poverty line of \$1.90 per person per day)), INS measures the quality of the institutional infrastructure, GEXP is government spending/public debt, K is the stock of available capital, X is a vector of other control variables hypothesized to affect output growth and reduce the prevalence of poverty, η_i is a time-invariant unobserved country-specific effect term, and Is the usual error term. The main control variables are trade openness, inflation, population, unemployment rate, interest rate, and real GDP. Equation (1) forms the basis for the estimation.

Equation (1) allows us to assess whether or not government spending and/or public debt have a significant influence on economic growth and poverty reduction in sub-Saharan Africa.

To control for the unavailability of poverty data in a consistent manner and business cycle phenomenon, the study adopts a 5-year cumulative overlapping, and a 5-year cumulative non-overlapping average model to account for missing data and. Importantly, the 5-year cumulative average is more appropriate since using

the annual rate captures a short-term impact, while for the 5-year specifications, the study captures the (more relevant) long-term impact. This is shown below:

$$y_{i,t+k} = \tau_{i,t+k-1} + \pi INS_{i,t+k} + \theta GEXP_{i,t+k} + \vartheta K_{i,t+k} + \gamma X_{i,t+k} + \mu_i + \nu_t + \varepsilon_{it} \qquad (2)$$

where $y_{i,t+k}$ is a vector of poverty measures (multi-dimensional poverty, international poverty line of \$1.90 per person per day), $k= 1$ or 5 (the study used two different measures in the empirical estimation: 5-year cumulative overlapping growth rate $y_{it/t+5}$, where t takes annual values; and a 5-year cumulative non-overlapping growth rate, where t takes the values at the start of each half-decade, μ_i is country fixed effects, ν_t is the time-fixed effects and ε_{it} is the error term.

The baseline estimation technique is the panel fixed-effects corrected for heteroscedasticity and autocorrelation. However, given the strong potential for the endogeneity and the reverse causation of the poverty index (i.e., negative growth rates of per-capita GDP are likely to increase the prevalence of poverty), and for robustness check, the study used various instrumental variable estimation techniques (system GMM) to control for the potential simultaneity and endogeneity problems.

As a form of robustness, the study performs a cross-sectional dependence test on the data to ensure that the cross-section in the model is independent for consistent coefficient estimates (Pesaran, 2004).

The result of the cross-sectional dependence tests is presented in Table A4 in the supplementary file.

The null hypothesis (H$_0$) is that there is cross-section independence, and the alternative hypothesis (H$_1$) is that cross-sectional dependence is present. A battery of cross-sectional dependence tests is applied (see Table A4).

As revealed in Table A4, the results reject the null hypothesis of cross-sectional independence across all specifications.

3.2.2 Spatial Dependence Test

Following recent studies (see Ramírez et al., 2017), the study models spatial dependency in panel data. To account for spatial dependence in the growth model of Equation (1), a spatial autoregressive model (SAR) is commonly used as a starting point:

Spatial Autoregressive Model. The basic equation for the SAR model is:

$$y_t = \rho W y_t + X_t \beta + \mu + \varepsilon_t \qquad\qquad t = 1...,T . \qquad (3)$$

where y_t denote the *n x 1* column vector of the dependent variable, and X_t denote the *n x k* matrix of regressors, $t = 1..., T$ indicating periods. For each cross-section, W is the n X n matrix describing the spatial arrangement of the n units, and each entry $w_{ij} \in W$ represents the spatial weight associated with units *i* and *j*. To exclude self-neighbors, the diagonal elements w_{ii} are conventionally set equal to zero. It is assumed that $\mu \sim N(0, \sigma_\mu^2)$ in the random effect case, while μ is a vector of parameters to be estimated in the fixed effect variant. The standard assumptions—that $\mu \sim N(0, \sigma_\mu^2) \varepsilon_{it}$ and $E(\varepsilon_{it} \varepsilon_{js}) = 0 \, for \; i \neq j$ or $t \neq s$ — apply in this case.

Table 1. Descriptive Statistics of Key Variables

	$1.90	$3.20	Multidi grow.	P. debt	health spending	Pop.	Real.int	INF	UNEM	TAX	Educ spending.	CORR	TRADE	REER	pcapGDP.
Panel A. *Summary statistics*															
mean	16.57	31.80	50.86	76.1	7.21	2.46	11.02	48.63	9.19	14.06	15.04	2.08	74.61	99.87	2.08
median	15.4	34.50	53.0	64.2	6.02	2.64	7.3	6.62	7.42	13.08	14.99	2.00	66.94	97.75	1.81
std. dev.	11.46	15.9	23.03	65.12	4.43	1.08	53.89	397.78	7.59	6.6	7.57	0.71	34.91	34.68	4.89
minimum	0.1	0.70	8.90	2.93	4.02	-3.67	-84.09	-0.21	0.31	3.72	1.22	0.00	29.62	13.14	-10.31
maximum	63.6	77.1	90.9	528.9	16.07	6.63	746.5	5444.4	37.03	15.01	59.51	3.75	229.63	332.0	50.75
observations	200	200	200	200	200	200	200	200	200	190	200	185	184	200	200
Panel B.															
$1.90	1.000	0.962	0.945	0.205	0.321	0.490	0.358	0.400	-0.539	0.102	-0.390	-0.17	-0.470	0.324	0.045
$3.20		1.000	0.995	0.190	0.453	0.586	0.324	0.342	-0.681	0.521	-0.401	0.433	-0.619	0.241	-0.008
Multidi			1.000	0.170	0.124	0.564	0.307	0.323	-0.673	-0.78	-0.379	-0.61	-0.616	0.228	0.006
CGD				1.000	0.042	0.180	0.260	0.077	-0.231	-0.05	0.176	-0.36	-0.100	0.227	-0.334
Sp.health					1.000	0.232	0.126	0.089	0.154	0.123	0.31	-0.07	-0.298	0.262	0.045
Popula.						1.000	0.257	0.060	-0.697	-0.42	-0.518	-0.70	-0.609	0.330	-0.145
Real.int							1.000	-0.132	-0.182	-0.05	-0.325	-0.36	-0.302	0.041	0.005
INF								1.000	0.002	0.124	-0.311	-0.15	-0.619	0.016	-0.220
UNEM									1.000	0.83	0.275	0.63	0.579	-0.189	0.139
TAX										1.000	0.30	0.080	0.462	-0.407	-0.243
Sp.educ.											1.000	0.164	0.468	-0.045	-0.041
CORR.												1.000	0.329	-0.115	0.064
TRADE													1.000	0.020	0.192
REER														1.000	-0.048
pcapGDP.															1.000

Source: Research finding.

Notes: Table 1 shows the descriptive statistics and correlation matrix. $1.90, $3.20, and Multidi are measures of poverty. While INT, INF, CORR, P. debt, Pop growth, health spending, UNEM, TAX, edu spending, TRADE. REER, pcapGDP, denote interest rate, inflation, control of corruption, central government debt (total debt), population (growth rate), government spending on healthcare (% of total expenditure), unemployment rate (ILO estimates), tax revenue, government spending on education (% of total expenditure), trade openness, real effective exchange rate, and per capital GDP (growth rate), respectively.

4. Empirical Results and Discussion

4.1 Unit Root Test

The results of the unit root tests (results not reported) indicate that all the variables attain stationarity at level. That is, they are stationary at [I(0)] without first-differencing since four of the five-unit root test types show that variables are stationary at [I(0)].

The study presents the baseline estimation results in Table 2. The results of the fixed effect panel estimation show that government spending (proxied by government spending on health and education/public debt) have not translated to a reduction in poverty levels in SSA. Rather, the results indicate that despite increased government spending, poverty persists across SSA. Specifically, the results indicate that government spending on health and education has no significant impact on the multi-dimensional poverty in Africa. This implies that the increase in government spending and/or public debt have not translated to a reduction in the level of multi-dimensional poverty in the region.

One economic implication of the increase in public debt is that further accumulation of public debt in the region may further constrained the fiscal space for any crucial public investment (such as human and physical capital) which might worsen the poverty situation in the region.

Further, the study interacted government spending and public debt with the corruption index. The results indicate that corruption disrupts the intended economic effect of government spending in reducing extreme poverty in the region. As seen in the result in Table 4, the interactive effect of the corruption index with government spending (i.e., public debt and government spending on health and education) have a positive and significant impact on poverty, indicating that corruption reduces the effectiveness of government spending in reducing poverty in the region.

On the theoretical front, the result negates the Keynesian hypothesis on the need for government interventions to minimize business cycle fluctuations, redistribute income and reduce poverty. This might not be unconnected with the high level of corruption prevalent in Africa countries. Evidence shows that the corruption control in SSA is too low (corresponding to a high level of corruption in SSA) which inhibits government fiscal policies from achieving its poverty eradication agenda. This is consistent with a recent report by Africareport (2020) that corruption is rife in SSA which might escalate that the level of poverty in the region.

Table 2. Fixed Effect (within) Regression Model

Variable	Poverty gap $1.90 *Cumulative 5-year*		Poverty gap $3.20 *Cumulative 5-year models*		Multi-dimensional Poverty *Cumulative 5-year models*	
	Model 1 nonoverlapping		**Model 2** nonoverlapping		**Model 3** nonoverlapping	
Instruments/Estimator	L(1/2) Spend/debt	Av. gov.sp debt(n - i)	L(1/2) Spend/debt	Av. gov.sp. debt(n-i)	L(1/2) debt	Av. gov.sp debt(n - i)
Poverty gap $1.90(-1)	–		–		–	
Poverty gap $3.20(-1)	–		–		–	
Multi-dimensional(-1)	–		–		–	
Public.debt	.026*** (.0084)		.0265*** (.0114)		.0410*** (.020)	
Health spending	-.002 (.0542)		.0142 (.1265)		.0392 (.0350)	
Pop. growth	.0145* (.0082)		.0125** (.006)		.0071** (.0037)	
Real.int	.0002*** (.0001)		-.1248 (.113)		.0057** (.0031)	
INF	.0095*** (.0012)		-.0043* (.0025)		.0046* (.0024)	
UNEM	.038* (.022)		-.0023 (.3574)		-.7175 (1.1063)	
TAX	-.1023 (.1056)		-.1980 (.200)		.0974** (.050)	
Educ spending.	-.0073 (.1096)		-0.012* (.007)		-0.1740 (.3838)	
CORR.	2.031*** (1.02)		0.1001** (.055)		.0400*** (0.020)	
percapGDP.	-0.024 (.1085)		-0.0103 (.1454)		0.0675 (1.061)	
Health spending*CORR.	0.0420*** (.011)		–		–	
Edu spending*CORR	.0051** (.0027)		–		–	
P.debt*CORR	0.043*** (.013)		–		–	
Constant	19.466(0.000)		23.938(0.001)		53.983(0.000)	
AR correction	lag (2)		lag (2)		lag (2)	
Observations	118		118		118	

Source: Research finding.

The result is also substantiated by the significant positive impact of corruption on poverty indices, regardless of the poverty index (see Table 4). This result is supported by Acemoglu and Robinson (2012), and Olaoye and Aderajo (2020) who argue that the vicious cycle of poverty is deepened in an environment with extractive political and social institutions. This finding is also consistent with Smaoui and Nechi (2017); Gazdar and Cherif (2015); De Vita Trachanas and Luo (2018); Olaoye et al. (2020a) who note that political corruption and over-sized government hinder government spending from stimulating economic growth.

Similarly, economic growth (captured by per capita GDP) has no significant impact on multi-dimensional poverty. This suggests that economic growth witnessed in African countries in the last few decades is not "pro-poor." A reasonable explanation of this is that the high level of corruption prevalent in the region hinders the trickle-down benefits of growth towards the poor. The result suggests that, while economic growth is an essential prerequisite for progress, it may not always lead to poverty reduction. The result is consistent with the findings of Dauda (2016) who argues that the high level of poverty in Nigeria is attributed to non-pro-poor growth. However, the results contradict the findings of Rashid and Intartaglia (2017) who found that absolute poverty decreases with economic growth. The results may be attributable to the fact that, unlike Akram (2016) and Rashid and Intartaglia (2017) that captures short-run impact (using annual data) of government spending and financial development on poverty reduction, the five-year cumulative specifications allow us to capture the long-term impact of the effect of government spending on poverty.

Further, on the separate impact of government spending on education and health on poverty, the empirical findings reveal that neither category of government spending significantly reduces poverty in sub-Saharan Africa. This might be because budgetary allocations to these two sectors have not been adequate. This implies that African countries have not met the minimum required allocation to these two sectors (namely, health, and education). Available evidence suggests that budgetary allocations to these two sectors hover between 7% to 15% on average, respectively (see Table 1). This is a far cry from the 26% allocations recommended by UNESCO to the education sector alone, and the 15% allocation to the health sector as recommended by WHO.

Similarly, the results also show that tax (revenue) exerts a statistically insignificant impact of poverty in SSA, except in model 3 where tax (revenue) has

a positive effect on poverty. Again, this can be attributed to the low quality of institutions prevalent in African countries (especially in oil-rich countries) which made it possible for political elites to siphon money out of the country. Evidence shows that up to $50billion was laundered.

Lastly, the result might also be an indication that tax revenue in the region (at 14 per cent of GDP, see Table 1) is far below the desired and remains below that of the OECD (24 per cent) and other emerging and developing countries. Coulibaly and Gandhi (2018) notes that the tax rate in the African region is 4 percentage points below the tax capacity of the region due to inefficiencies in revenue collection, which causes leakages estimated at $110 billion a year.

Table 3. Dynamic Panel Estimates (System GMM) Model

Variable	Poverty gap $1.90 Cumulative 5-year models		Poverty gap $3.20 Cumulative 5-year models		Multi-dimensional Poverty Cumulative 5-year models	
	Model 1 non-overlapping	**Model 2** overlapping	**Model 3** non-overlapping	**Model 4** overlapping	**Model 5** non-overlapping	**Model 6** overlapping
Instruments/Estimator	L(1/2) Spend/debt	Av. gov.sp debt(n - i)	L(1/2) Spend/debt	Av. gov.sp debt(n - i)	L(1/2) Spend/ debt	Av. gov.sp debt(n - i)
Poverty gap $1.90(-1)	.5563 ***		−		−	
Poverty gap $3.20(-1)	−		.5975***		−	
Multi-dimensional(-1)	−		−		.6077***	
Public debt	.0222** (.011)		.0253** (.0128)		.0359** (.018)	
Health spending	.0002* (.00011)		.0614 (.0490)		-.0392* (.024)	
Pop. growth	.0258* (0.03)		.0509* (.027)		.0475** (.020)	
Real.int	.0003* (.00015)		.0013** (.000065)		-.0003 (.0862)	
INF	-.0001 (.0188)		.0005*** (.0002)		.0024 (.0423)	
UNEM	.098*** (.044)		.0622*** (0.02)		.0342** (0.017)	
TAX	-.1023 (.1047)		-.5980 (6.7159)		.0974* (.052)	
Educ.spending	-.00052* (0.00027)		-.2119 (3.092)		1.1214 (2.6733)	
CORR.	0.0401* (0.021)		0.0212*** (0.01)		2.0679 ** (1.02)	
percapGDP	0.0291 (1.098)		-0.0221** (.009)		-.1426 (.8940)	
Cons	18.717***		18.630***		26.242***	
Sargan	0.1113		0.2090		0.0253	
AR(1)	0.0460		0.0291		0.0134	
AR(2)	0.2484		0.1755		0.1684	
Observations	160		160		160	

Source: Research finding.

Table 4. Dynamic Panel Estimates (System GMM) Model

Variable	Poverty gap $1.90 Cumulative 5-year models		Poverty gap $3.20 Cumulative 5-year models		Multi-dimensional Poverty Cumulative 5-year models	
	Model 1 non-overlapping	**Model 2** overlapping	**Model 3** non-overlapping	**Model 4** overlapping	**Model 5** non-overlapping	**Model 6** overlapping
Instruments/Estimator	L(1/2) Spend/debt	Av. gov.sp debt(n - i)	L(1/2) Spend/debt	Av. gov.sp debt(n - i)	L(1/2) Spend/ debt	Av. gov.sp debt(n - i)
Poverty gap $1.90(-1)	.5563 ***	.4054 ***	–		–	
Poverty gap $3.20(-1)	–		.5975***	.4452***	–	
Multi-dimensional(-1)	–		–		.6077***	0.8743***
Public debt	.0222*** (.011)	0.146*** (0.006)	.0253** (.0128)	-0.007 (0.027)	.0359** (.019)	0.1022*** (0.012)
Health spending	.0012* (.00067)	.2222 (2.027)	.0614 (.0490)	.1150 (0.17)	.0392* (.022)	-1.224 (12.324)
Pop. growth.	.0258* (0.03)	.0062** (0.002)	.0509* (.027)	-.4846 (0.34)	.0475*** (.020)	0.0321*** (0.0012)
Real.int	.003*** (.00015)	.0066*** (0.003)	.0013** (.00065)	.00694 (0.041)	-.0003 (.0862)	0.0011** (0.00056)
INF	-.0001 (.0188)	.0043* (0.0023)	.0005*** (.0002)	.0009 (0.019)	-.0024 (.0423)	0.0043*** (0.002)
UNEM	.098*** (.044)	0.0015** (0.001)	.0622*** (.020)	.221 (1.202)	.0342** (.019)	0.0021** (0.0011)
TAX	-.1023 (.1047)	0.0102** (0.0052)	-.5980 (6.7159)	1.406 (10.124)	.0974* (.052)	-10.234 (21.023)
Educ spending.	-.0052** (.00027)	0.1064 (0.1120)	-.2119 (3.092)	-.0181 (0.141)	1.1214 (2.6733)	-12.342 (8.761)
CORR.	0.0401** (.021)	0.1032** (.0041)	0.0212*** (0.01)	.0062 (0.004)	2.0679*** (1.02)	0.0422*** (0.011)
percapGDP.	0.0291 (1.098)	0.0024** (0.01)	-0.0221** (.009)	.0019 (0.004)	-.0488 (.8940)	1.003** (0.51)
Cons	18.717(0.004)	24.232(0.0010)	18.630(0.017)	32.001(0.0023)	26.242(0.005)	14.086(0.1114)
Sargan	0.1113	0.5670	0.2090	0.3482	0.0253	0.342
AR(1)	0.0460	0.0139	0.0291	0.0533	0.0134	0.1034
AR(2)	0.2484	0.4177	0.1755	0.5894	0.1684	0.3245
Observations	160	284	160	284	160	284

Source: Research finding.

For robustness, the results of the system GMM are presented in Tables (3) and (4). The results remain robust to different estimation techniques, differing sample sizes, and alternative models.

The validity of the instrumental variables and the robustness of the system GMM are confirmed by the Sargan test of over-identifying restrictions and AR(1) and AR(2) tests. The test reveals that the instrumental variables are valid and that the model is free from the problem of serial autocorrelation, and that the estimates are robust and reliable.

5. Other Robustness Checks
5.1 Controlling for Different Country Groups
To control for heterogeneity, the study models different country groups (see Table A5). The results are robust to different estimation techniques, differing sample sizes, and alternative models (see Table 5). The results show that government spending (captured by spending on health and education, access to water, access to electricity, and public debt) do not have a statistically significant impact on poverty in all the specifications. While, economic growth (denoted by per capita GDP) exerts a positive and statistically significant effect on poverty across all the models, indicating that economic growth recorded in the region is not pro-poor. For oil-exporting countries (see models 3 and 4), the study found that unemployment, public debt and corruption are major drivers of poverty.

Controlling for spatial dependence and spillover effects of poverty

The study accounts for the spillover effects of poverty in SSA. The results affirm that there is evidence of spillover of poverty across the East and West Africa sub-region.

Regardless of the econometric technique adopted, the results remain robust to different estimation techniques, differing sample sizes, and alternative models. The spatial specification model indicates that there is some form of spatial dependency in the prevalence of poverty in the two sub-regions (see Table 6), indicating that to eradicate poverty in the region, SSA governments must adopt a coordinated response to stop the spread of this dreaded monster.

Table 5. Dynamic Panel Estimates (System GMM) Model for Different Country Groups

Non-overlapping Cumulative 5-year mo	Whole Sample		Oil Exporters		Other resource-intensive		Non-resource-intensive		Middle-income	
variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	9	10
Poverty gap	$1.90	Multidimensional	$1.90	Multidimensional	$1.90	Multidimensional	$1.90	Multidimen	$1.90	Multidimen
Poverty $1.90(-1)	.5563***		-.0285		.3716*		.6959*			
Poverty $3.20(-1)	−			0.331		.2014		.8486**	1.467	.5339**
Multi-dimensional(-1)	−	.6077***	−							
Access to electricity	−	−	-.0760	-.1496	-.8868	-.9900***	-.0770	-.1096	-.6558	0 .1168
			(.2726)	(0.4023)	(.5335)	(.4302)	(.3669)	(.5282)	(.767)	(.1587)
F-Corruption	.0401**	2.0679***	.4266	.1006***	-38.21***	-.3286	-2.2140	-3.4434	1.2424	-3.3215
	(.021)	(1.02)	(1.3572)	(0.05)	(18.167)	(16.724)	(5.2235)	(4.8639)	(7.704)	(6.3355)
Spending on health	.0012*	.0392*	0.0659	-.0041	0.0323*	0.0065*	1.002*	-.0021*	0.2002	1.1740
	(.00067)	(.022)	(0.07)	(.0325)	(0.018)	(0.0038)	(.5760)	(.0012)	(0.80)	(4.4110)
real GDP	0.0291	-.0488	-.0096	.10223*	3.9932*	4.0305*	-.2936	-.8790	.3279*	.2044***
	(1.098)	(.8940)	(.0891)	(0.611)	(2.231)	(2.3019)	(1.0385)	(1.6119)	(0.189)	(.1018)
Pop. growth	.0258***	.0475***	-.9075	2.1410**	-2.7941	-2.2084	-1.4694	-9.1073	1.8209	34.6121
	(0.003)	(.020)	(6.5899)	(1.124)	(4.6330)	(3.4544)	(8.7699)	(14.252)	(11.5380)	(28.2940)
Unemployment	.098***	.0342**	.0122***	.1055***	0.0128	0.1045*	1.0850	.2286**	2.8456*	-.3285
	(.044)	(.019)	(.006)	(.0422)	(0.043)	(.061)	(3.4060)	(.1240)	(1.620)	(0.5518)
Spending on education	-.00052**	1.1214	1.119	- .2332	1.432*	1.481*	-4.002	.0051	2.006	3.5580
	(.00027)	(2.6733)	(2.240)	(.1044)	(0.8342)	(0.784)	(6.250)	(1.022)	(4.5800)	(2.8684)
Public debt	0.222***	.0359**	1.2980***	.0223***	0.0243**	0.481***	0.1614	12.023*	.0108	0 .1059**
	(.011)	(.019)	(0.4567)	(.006)	(0.013)	(0.0105)	(0.10)	(6.702)	(.0700)	(.0579)
Access to water	−	−	0.0032	1.054	2.043	10.092	0.5510	.0016*	.2149	2.3501
			(0.012)	(2.453)	(1.4008)	(14.007)	(0.420)	(0.0009)	(1.3806)	(1.9331)
Sargan	0.1113	0.0253	0.004	0.008	0.021	0.057	0.1000	0.005	0.0642	0.0532
Hansen			0.790	0.990	0.733	0.887	0.563	0.637	0.452	0.740
AR(1)	0.0460	0.0134	0.092	0.116	0.050	0.030	0.162	0.176	0.394	0.050
AR(2)	0.2484	0.1684	0.310	0.545	0.665	0.924	0.487	0.795	0.495	0.583
Observations	160	160	20	20	44	44	44	44	56	56

Source: Research finding.

Table 6. Diagnostic Test for Spatial Dependence in OLS Regression Weights Matrix

Name: w
Type: Distance-based (inverse distance)
Distance band: 0.0 < d<= 16.0
Row-standardized: Yes

Diagnostics

Test	West Africa			East Africa		
	Statistic	df	p-value	Statistics	df	p-value
Spatial error						
Moran's I	2.886	1	0.004	-0.305	1	0.0101
Lagrange multiplier	4.015	1	0.045	1.023	1	0.312
Robust Lagrange multiplier	0.026	1	0.071	5.632	1	0.018
Spatial lag:						
Langrage multiplier	5.779	1	0.016	0.007	1	0.039
Robust Langrage multiplier	1.791	1	0.101	4.617	1	0.032

Regression estimates using spatial error and Spatial lag models

Multidimensional poverty	West Africa		East Africa	
	Spatial (error model)	(lag model)	Spatial (error model)	(lag model)
Public debt	-0.067	-0.0505***	0.0500***	0.0262**
Health spending	-0.0010	0.0017	0.1023	0.0421*
Educ. spending	-0.3443	-0.0556***	0.2290	-0.1443
Pop.growth	0.9393	0.0553***	1.124***	0.864***
UNEM	0.062***	-0.168	-1.139	-0.692
CORR	0.056***	0.020*	0.2034	0.1043**
TAX	-0.19	0.028	—	—
percapGDP	-0.293	-0.252	0.0534***	-2.515
rho		-1.002***	0.0610	
lambda	-1.500***		-1.927***	

The numbers reported in the table shows the coefficients, and *, ** , and *** denote 10, 5, and 1 percent levels of significance, respectively.

Wald test of lambda/rho = 0:	chi2(1) = 29.30 (0.000)	8.89(0.003)	32.82(0.000)	0.012(0.914)
Likelihood ratio test of lambda/rho = 0:	chi2(1) = 8.13(0.004)	5.79(0.016)	6.70(0.10)	0.012(0.915)
Lagrange multiplier test of lambda/rho = 0:	chi2(1) = 2.34 (0.126)	3.268(0.071)	1.023(0.312)	0.007(0.933)

Source: Research finding.

5. Conclusion, Policy Implication and Recommendation

The study examined the effectiveness of fiscal policy in reducing poverty in a panel of 40 sub-Saharan African countries (SSA). The study is motivated by the fact the increase in the level of poverty across sub-Saharan Africa coincides with the increase in government spending. The results show that government spending has not translated to poverty reduction in SSA. Precisely, the study found that government spending has no significant impact on poverty in the long term.

The study makes the following recommendations based on the empirical findings in section 4.

One, sub-Saharan African governments should develop the human capital by devoting more economic resources to the health and education sectors to meet the 26% (percentage of total budget) as recommended by UNESCO and increase the allocation to health sector to 15% (percentage of total budget) as recommended by WHO.

Two, governments should improve domestic governance by formulating and implementing policies that reduce room for corruption to the barest minimum so that government spending will be channeled to critical areas.

Three, the government may need to get the private sector involved (through Private Public Partnership (PPA) in the funding of public infrastructure and concentrate on creating a clean and business-friendly environment to reduce poverty.

Four, governments may need to develop policies that will be effective in redistributing income towards the poor. For instance, governments may adopt a progressive tax system—where governments increase the tax on luxury goods and reduce the tax on necessities. While for direct tax, a progressive tax would mean that income tax increases as salary or income rises.

Five, governments need to implement social protection programs (such as unemployment and exclusion benefits to the citizens) to reduce the level of poverty in SSA.

Additionally, governments and policymakers may need to adopt a regional-coordinated effort to effectively combat or reduce the prevalence of poverty in the region.

Lastly, governments and policymakers in SSA oil-exporting countries may need to diversify the economy away from oil and promote non-oil sector growth.

The policy recommendations have been extracted from the empirical results and discussion in section 4.

Declaration of Conflict of Interest
The authors declare no conflict of interest.

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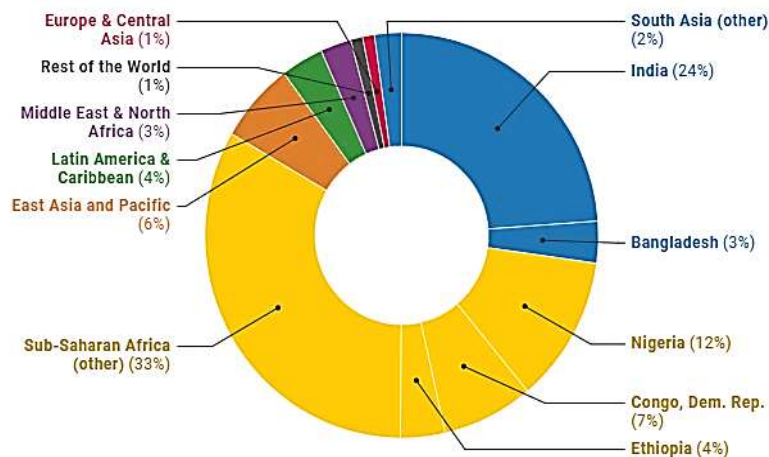
Appendix

Figure A1. Pictorial Diagram Showing Extreme Poverty Prevalence in the World
Source: PovcalNet (online analysis tool) World Bank (2019), Washington, DC.

Table A1. A List of 40 sub-Saharan African Countries used in this Study

Burkina Faso	Mozambique	Cameroon	Equatorial Guinea
Central African Republic	Niger	Congo	Gabon
Chad	Rwanda	Ghana	Namibia
Congo, DR.	Senegal	Kenya	South Africa
Ethiopia	Tanzania	Lesotho	Mauritius
	Uganda	Nigeria	Seychelles
	Zimbabwe	Sao Tome and Principe	
	Benin	Swaziland	
	Eritrea	Zambia	
	Togo	Cape Verde	
	Sierra Leone	Cote d'Ivoire	
	Angola	Mauritania	
	The Gambia	Botswana	
	Liberia		
	Malawi		
	Mali		

Source: World Bank Development Indicators (2021).

Table A3. Measurement and Sources of Key Variables

Variables	Definition/Measurement	Source
1. Institutional Quality Captured by F-Corruption	This index measures a country's fight against corruption	ICRG
2. real gross domestic product	It measures the productive capacity of the economy in real terms	World Development Indicators Database (WDI)
3. Capital stock	This is the general indicator for total capital stock.	WDI
4. Trade Open	It is a measure of the extent of trade openness and/or restriction	WDI
5. Poverty index	It measures the prevalence of poverty. We adopt different measures, such as the international poverty line of $1.90 for extreme poverty, the lower- and middle-income class poverty line of $3.20, and the multidimensional poverty measure.	WDI, World Bank, World Poverty Clock Data, Poverty and Equity data, and Quartz Africa, Oxford Poverty and Human Development Initiative
6. Real interest rate	This is the bank lending rate adjusted for prices	WDI
7. Inflation Rate	Measured by consumer prices	WDI
8. Unemployment	It measures the rate of unemployment in the country. ILO estimates	WDI
9. Government spending on health and education	It measures the total amount allocated to education and health as a percentage of total government spending	WDI, National estimates.
10. Access to electricity (percent of the population)	It measures the percentage of the population with access to electricity	World Bank, WDI
11. Access to water and sanitation	It measures the percentage of the population with at least basic drinking water and sanitation services	World Bank, WDI
15. Financial development	This measures financial depth, access, efficiency, and stability.	IMF, International Financial Statistics, Financial Development Index Database

Table A4. Panel Cross-Section Dependence Tests

CGD

Test	Results
1.Pesaran (2004)	21.876***(0.0000)
2.Pesaran (2004) CD	5.224***(0.0000)
3.Breusch & Pagan (1979)	170.2532***(0.000)
4.Pesaran (2007)	7.2453***(0.0000)
5.Baltagi, Feng & Kao (2012)	23.130***(0.0000)

Source: Research finding.

Note: 1- Pesaran (2004) cross-sectional dependence in panel data models test;
2- Pesaran (2004) CD test for cross-section dependence in panel time-series data;
3- Breusch-Pagan LM test of independence;
4- Baltagi et al. (2012) bias-corrected scaled LM test;
5- Pesaran (2007) bias-adjusted LM. P-Values in parentheses. Tests include the intercepts. ***$p<0.01$, **$p<0.05$, *$p<0.1$.

Table A5. Sub-Saharan Africa: Member Country of Groupings

Oil exporters	Other resource-intensive countries	Non-resource-intensive countries	Middle-income countries
Angola	Botswana	Benin	Angola
Cameroon	Burkina Faso	Burundi	Botswana
Chad	Central Africa Rep.	Cabo Verde	Cabo Verde
Rep. of Congo	Dem. Rep. of Congo	Comoros	Cameroon
Equatorial Guinea	Ghana	Cote d'Ivoire	Dem. Rep. of Congo
Gabon	Guinea	Eritrea	Cote d'Ivoire
Nigeria	Liberia	Ethiopia	Equatorial Guinea
South Sudan	Mali	The Gambia	Gabon
	Namibia	Guinea-Bissau	Ghana
	Niger	Kenya	Kenya
	Sierra Leone	Lesotho	Lesotho
	South Africa	Madagascar	Mauritius
	Tanzania	Malawi	Namibia
	Zambia	Mauritius	Nigeria
	Zimbabwe	Mozambique	Senegal
		Rwanda	Seychelles
		Sao Tome & Principe	Sao Tome & Principe
		Senegal	South Africa
		Seychelles	Swaziland
		Swaziland	Zambia
		Togo	
		Uganda	

Source: Regional Economic Outlook, Sub-Saharan Africa, World Economic and Financial Surveys, International Monetary Fund (IMF) of Washington, DC, October 2020.