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Original Research

Effects of Fiscal Deficit on Economic Growth in Sub-Saharan Africa: A Dynamic Panel Data Analysis

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Abstract

The study examines the impact of budget deficits on GDP growth in 42 sub-Saharan African countries between 2011 and 2021 using a two-step GMM approach. The data is sourced from the World Development Indicator and shows no signs of random walk. Fiscal deficits negatively impact long-term economic growth in these countries, but they help in the short run. The GMM method shows that long-term economic growth decreases by 0.013 percent for every one percentage point change in fiscal deficit. However, a 0.036 percentage point boost in economic growth is linked to a percentage point shift in the deficit in the near run. Budget deficits have a larger positive short-run coefficient than negative long-run coefficients. The study suggests that real interest rates and gross fixed capital creation are the main drivers of economic growth in SSA countries. The long-term economic success is positively and significantly affected by gross fixed capital formation. The report concludes that SSA states should reduce their budget deficits and increase funding for gross fixed capital formation.

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INTRODUCTION

Economists and policymakers have largely concentrated on the correlation between government spending and GDP growth. Policymakers paid close attention to how developing nations' fiscal deficits affected economic growth during the 2008 global financial crisis, when these deficits were the worst they had ever been (Lau & Yip, 2019; Tran, 2022). This further captivated lawmakers in the wake of the COVID-19 pandemic. This is not limited to SSA countries; it applies globally (Khan et al., 2022). All throughout the world, people's lives have been turned upside down by the COVID-19 pandemic. According to Anyanwu and Salami (2021), the global pandemic of COVID-19 has a devastating effect on the African economy.

Recent empirical research by Olaoye et al. (2023) established that fiscal deficits in sub-Saharan African countries are the underlying cause of inflation in Africa. Following the 2019 global declaration of COVID-19 by the World Health Organization, Haroutunian et al.

(2021) found that the virus caused fiscal tension in both rich and developing nations. The budget imbalance has been viewed by Silahtaroğlu et al. (2021) as a key sign of worldwide financial crises throughout the past ten years. Everyone, from the poorest nations to the wealthiest, took this as gospel. In a similar vein, Artés and Jurado (2018) linked government disintegration to the budget deficit.

The correlation between government spending and GDP growth has been the subject of multiple research works in the field of modern economics. One source of economic fragility and a contributor to growing public debt is the budget imbalance, according to Nizamuddin (2021). Without investment in capital production, fiscal deficits have a negative effect on economic growth, according to Sharma and Mittal (2019). According to Dick (2022), fiscal policy obscures the overall and macroeconomic performance of the economy. Contrary to expectations, a comparable study by Oyeleke (2021) indicated that government deficits actually boost economic growth. The question of whether a certain level of fiscal deficit promotes economic growth was explored by Tran (2022). A lesser budget deficit is connected with higher economic growth, while a high level of fiscal deficit is associated with negative growth, according to the study. According to research by Ehigiamusoe and Lean (2020), which looked into the function of deficit financing in West African nations, fiscal deficits account for the bulk of economic growth in West Africa. The impact of government spending cuts on developing economies in West Africa was the focus of an empirical study by Edo and Okodua (2021). Their study primarily aims to investigate the impact of budget deficits on market capitalization. Awolaja and Esefo (2020) used pool mean group estimation to look at how budget deficits affect SSA economic growth. Fiscal deficits have a favorable effect on economic growth in SSA nations, according to their analysis.

Ahmad and Aworinde (2019) set out to answer the question, "Is the fiscal deficit inflationary in African countries?" in their scientific study. According to their research, African countries need to implement fiscal consolidation measures because their deficit spending is leading to inflation. No matter how many studies looked at the topic, the impact of budget deficits on GDP growth was never determined. Furthermore, to the best of our knowledge, no one has yet conducted a comprehensive investigation into the current correlation between budget deficits and GDP growth, with the exception of Awolaja and Esefo's (2020) work, which looked only at the effects of deficits in SSA nations. With the primary goal of providing fresh evidence utilizing the GMM framework and updated data, this study seeks to capture the current link between budget deficit and economic growth in SSA.

In comparison to other works, this article's contribution stands out in three ways. It begins with revising the time frames of the studies from 2001 to 2021. This demonstrates that the current policy conclusion drawn from the research period is grounded in the most recent evidence available. Fiscal deficits and their effects on economic growth over the past several decades are hence the focus of this research. Second, a novel econometric approach is used for estimate in the study.

Consequently, this study employs the two-step generalized method of moment. Herein is the methodological and data-driven distinction between this study and its predecessors. The third distinctive feature of this study is that it was conducted during the height of the COVID-19 epidemic, when the fiscal deficit burden on SSA countries was at its most difficult.

Here is the breakdown of the remaining sections of the paper: Section 2 provides a literature survey of applicable theoretical and empirical works. Section 3 contains the study's methods and data, while Section 4 presents the study's results and discussions. The study's findings and their policy implications were finally presented in Section 5.

Relevant empirical literature

The purpose of this section is to review empirical works that are highly related to and pertinent to the topic of fiscal deficits and economic growth. Scientific inquiry is supported by the literature. In this part, we also evaluated the relationship between GDP growth and each of the explanatory variables. Between 1991 and 2018, Awolaja and Esefo (2020) looked at the budget deficits and economic growth of SSA countries. Budget shortfalls have varied effects in the long and short term, according to their research. There was a favorable short-term effect of the budget deficit on economic growth and a negative long-term effect. Using a panel of twenty SSA nations and a pooled mean group estimation technique, they carried out their analysis.

Among the Eurozone nations studied between 1995 and 2015, Kryeziu and Hoxha (2021) discovered a favorable correlation between fiscal deficit and GDP growth. Using the multiple linear regression estimate method, they determined that, within the time frame of the study, lengthy deficits were more detrimental than short ones. A major imbalance in an economy's macroeconomic structure can also be caused by it.

From 2000–2021, Dauti and Elezi (2022) used the panel GMM estimate approach to determine that the budget deficit impacted Eurozone economic growth. While the fiscal deficit had a growth-enhancing effect when it interacted with the COVID-19 pandemic, it had a growth-detrimental effect when it interacted with the deficit crises.

The correlation between West African countries' levels of financial development and their budget deficits and economic growth is country-specific, according to Ehigiamusoe and Lean (2020). According to their research, nations with more developed financial systems are less likely to see the negative effects of fiscal deficits. The authors of the study went on to say that reducing the long-term impact of fiscal deficits is much more important than financial development on its own to fix the economy.

Even though they face global economic and budgetary issues, South Asian countries like China and India continue to rank among the top in terms of economic growth, according to research by Nizamuddin (2021). In spite of everything, their purchasing power parity rose.

In SSA nations, Tran (2022) looked at the question of whether a healthy budget deficit encourages economic growth. The study found that the magnitude of the budget deficit matters in the relationship between the two variables, using panel data from 2000 to 2019 and 48 nations with the aid of panel threshold

regression. The sample countries' economic growth was positively correlated with their budget deficit. In addition, national economies suffer when budget deficits are greater. As a result, governments need to reduce their budget deficits.

Real effective exchange rates and their relationship to economic growth has been the subject of multiple studies. For example, in line with Rodrik's conclusion, Seraj and Coskuner (2021) discovered that undervaluation significantly affects economic growth. Using data from 93 nations between 1990 and 2018, they concluded that the Rodrik method is less successful than the fundamental equilibrium model of exchange rates. Similarly, Zhu et al. (2022) discovered that between 1981 and 2016, Asian countries' economic growth was significantly aided by a real effective exchange rate. Even in times of financial crisis, the study found that the real exchange rate significantly affects economic growth based on the fully modified ordinary least squares (FMOLS) model that was examined.

An increase in capital accumulation is one way in which a real effective exchange rate promotes economic growth, according to Rapetti (2020). This is in contrast to the study's finding that volatility in exchange rates is inversely related to economic growth. The actual growth of the economy is reduced by real appreciation and increased by real depreciation, according to research by Habib and Stracca (2017). After reexamining the prior hypotheses, Glüzmann et al. (2012) found the opposite when they looked at the connection between an undervalued exchange rate and economic growth.

Several empirical works have examined the impact of inflation on economic growth because it is a basic macroeconomic topic. For example, in countries that do not follow the BCBS model, inflation is a key factor in economic growth (Batrancea et al., 2022). Inflation targeting and policies focused on society were recommended based on their analysis of panel data from seven nations spanning 1990 to 2019. There is ongoing dispute about the relationship between inflation and economic growth, but Mandeya and Ho (2022) discovered that a large body of empirical evidence supports the idea that inflation hinders growth.

Various empirical economic works have argued on the nature of the relationship between real interest rates and economic growth. From 1993 to 2017, Njie and Badjie (2021) examined the Gambia economy and discovered that interest rates had a negative correlation with economic growth. In a similar vein, Fk (2018) determined that interest rates hindered Swaziland's economic growth from 1980 to 2016.

The centrality of capital to economic growth has been a topic of economic debate since Adam Smith's time. There have been multiple empirical investigations conducted since then. According to Batrancea et al. (2021), gross capital formation is a key factor in SSA Africa's economic growth. Their research, which covered 34 SSA nations from 2001 to 2019, came to the conclusion that capital building should be the priority of policymakers. Aslan and Altinoz (2021) came to a similar conclusion, stating that national development is the foundation of the causal relationship between capital formation and economic growth. Capital production and

economic growth were found to be unidirectionally causative in Africa, according to their analysis. They found that gross capital formation has a negative effect on economic growth in SSA nations using a panel vector autoregressive model with data from 1980 to 2018.

MATERIALS AND METHODS

Data and Variables of the Study

This study's panel data, along with data from the World Bank Group's World Development Indicator Database, covers the years 2001–2021. You can trust these numbers for two main reasons. The first thing you should know is that it comes from a reputable international organization that has reliable data (World Bank, 2021; World Development Indicator, 2021). Second, it's the best option because macrovariable data is easily accessible.

Table 1 lists the study's variables along with brief descriptions of each. As a result, the study made use of six variables: one dependent variable and five explanatory factors. All things considered, the study variables were picked with due care. We followed Tran's (2022) instructions and added the study variables. Our research stands out from the others because we included government deficits in our models of economic growth. To that purpose, we based our research on the endogenous growth model hypothesis (Chandra, 2022).

Table 1

Descriptions of the study variables and expected sign of coefficients

Variables of the study	Description the variables	Expected sign
GDP per capita (constant 2015 US$)(RGDP)	GDP per capita is gross domestic product divided by midyear population. Data are in constant 2015 U.S. dollars.	
Gross fixed capital formation (% of GDP)(GFCF)	Private investment covers gross outlays by the private sector on additions to its fixed domestic assets.	+/_
Real effective exchange rate (RER)	The real effective exchange rate is the nominal effective exchange rate divided by a price deflator or index of costs. It is an index.	_
Real interest rate (%)(RIR)	The real interest rate is the lending interest rate adjusted for inflation as measured by the GDP deflator.	+
Inflation, consumer prices (annual %)(INF)	Reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services.	_
Fiscal deficit (% of GDP)(FDT)	Tax revenue (% of GDP) less general government final consumption expenditure as % GDP.	_

Source: *Authors' building, 2023*

The effect of fiscal deficits on the economic growth of SSA countries was studied, and Table 2 displays the sample countries of SSA. From 2011 to 2021, 42 nations were included in the study. We chose these nations because we had data on hand. The study does not include Somalia, Eritrea, Malawi, Liberia, China, or Guinea due to a lack of panel data for the study variables. Panel data analysis frequently use this sampling strategy.

Table 2

Sample SSA countries selected for the study

Sample SSA countries selected for the study					
S.no.	Countries	S.no.	Countries	S.no.	Countries
1	Angola	15	Ethiopia	29	Nigeria
2	Benin	16	Gabon	30	Rwanda
3	Botswana	17	Gambia, The	31	Sao Tome and Principe
4	Burkina Faso	18	Ghana	32	Senegal
5	Cabo Verde	19	Guinea-Bissau	33	Seychelles
6	Burundi	20	Kenya	34	Sierra Leone
7	Cameroon	21	Lesotho	35	South Africa
8	Central African Republic	22	Madagascar	36	South Sudan
9	Comoros	23	Mali	37	Sudan
10	Congo, Dem. Rep.	24	Mauritania	38	Tanzania
11	Congo, Rep.	25	Mauritius	39	Togo
12	Cote d'Ivoire	26	Mozambique	40	Uganda
13	Equatorial Guinea	27	Namibia	41	Zambia
14	Eswatini	28	Niger	42	Zimbabwe

Source: *Authors' building, 2023*

GMM Model Specification

Theoretically, the connection between government spending and GDP growth has been studied since Keynes's era and the entirety of the Great Depression's economic rescue efforts in the 1930s. The endogenous growth models, which see economic growth as a function of capital and labor, are the ones that this study's model is based on. Using the research of Kurantin (2017) and Abel et al. (2018), we modeled economic development in a way that takes budget deficits and other macro variables into account, which exacerbate fiscal ficiencies. Their models were used in our present study. Nevertheless, this model outshines theirs by include imports and other extra explanatory variables that exacerbate the fiscal imbalance in sub-Saharan Africa. Thus, the following functional relationship emerges between SSA nations' budget deficits and GDP growth:

$$RGDP = f(\text{FDT}) \quad (1)$$

Within this framework, RDGP denotes real GDP and FDT denotes the budget deficit proportional to GDP. The relationship between the budget deficit and the real GDP is seen in Equation (1). Government spending is a good indicator of economic growth in sub-Saharan African nations.

Building on previous research by Ahmad and Wajid (2013) and Rahman and Siddiquee (2022), this study incorporates fiscal deficit as its dependent variable. On the other hand, by incorporating control variables that are more relevant to the setting of SSA nations, the present model outperforms earlier efforts. With the control variables included, this is the model's functional form:

(FDT, INF, REER, IR, GFCF) (2)

Several variables are at play here, including the real effective exchange rate (RER), GFCF, inflation (INF), and IR. The study's principal variable and four control variables are shown in Equation (2).

Incorporating the variables into the model is essential. The empirical evidence for including inflation in the model is provided by Vinayagathasan (2013) and Batrancea et al. (2022), while the evidence for including the real effective exchange rate as an explanatory variable is provided by Habib and Stracca (2017). For gross fixed capital formation, the model follows Akobeng (2017), but for real interest rates, it utilizes Njie and Badjie (2021). However, our current model is better because it incorporates all the components of a growth model for the economy at the same time.We used the following System GMM (SGMM) model to perform the estimation:

$$RGDP_{it} = \eta_1 RGDP_{it-1} + \eta_2 EX_{it} + \eta_3 EX_{it-1} + \zeta_{it} \quad (3)$$

Where $RGDP_{it}$_it_it represents the actual gross domestic product of SSA nations and $\eta RGDP_{it-1}$ represents the time lag of the region's real gross domestic product growth. The study's explanatory variables are shown by EX_{it-1}_it, the lags of the explanatory variables' matrix are denoted by EX_{it-1}, and the error term is denoted by ζ_{it} .

The lagged dependent variable (RGDP) and its corresponding lags are represented by η_1, η_2 and η_3, respectively. The RGDP matrix includes all explanatory factors. The study period (2011–2022) and the cross sections of 42 SSA nations are represented by i and t, respectively.

The system generalized linear model (GMM) with all explanatory variables and the dependent variable's lag is shown in Equation (3).

The error term is expressed as follows in panel system GMM:

$$\zeta_{it} = \nu_{it} + U_{it} \quad (4)$$

The model's error component, shown in Equation (4), is the product of the idiosyncratic disturbance term (U_{it}) and the unobserved fixed effects (ν_{it}).

This is what you get when you incorporate the difference operator into the model:

$$\boldsymbol{\Delta} RGDP_{it} = \eta_1 \Delta RGDP_{it-1} + \eta_2 \Delta EX_{it} + \eta_3 \Delta EX_{it-1} + \Delta\zeta_{it} \quad (5)$$

$$\Delta\zeta_{it} = \Delta\nu_{it} + \Delta U_{it} \quad (6)$$

Δ stands for the model's difference operator. Equation (3) defines all the others. The system GMM model's difference operator and the error term's corresponding difference operator are shown in equations (5) and (6), respectively. Here is the initial dynamic system GMM model that our study estimates, taking into account all of the study's explanatory variables:

$$RGDP_{it}=B_0 + B_1 RGDP_{it-1} + B_2 FDT_{it} + B_3 INF_{it} + B_4 RER_{it} + B_5 RIR_{it} + B_6 GFCF_{it} + \zeta_{it} \quad (7)$$

In this case, $RGDP$ real represents GDP at time t, and $RGDP_{t-1}$indicates the dependent variable's lag. FDT has This study's primary variable—the fiscal deficit—is shown here.

The Inflation Rate (INF) The financial measurements include GFCF, IR, and RER, which stands for real effective exchange rate. While B_0 is the coefficient of the lagged dependent variable, the explanatory variables' coefficients are B_1, B_2, B_3 , B_4, B_5 and B_6. A vector containing the control variables is denoted as U_{it}.

The GMM model, which is estimated using the system GMM, is shown in Equation 7. For the sake of clarity and a more appealing model interpretation, one that leads to an elasticity interpretation, all variables were changed to the natural logarithm. The ability to interpret data by percentage change is made possible by this. According to the analysis As a result, the grand total is:

$$logRGDP_{it}=B_0 + B_1 logRGDP_{it-1} + B_2 logFDT_{it} + B_3 logINF_{it} + B_4 logRER_{it} + B_5 logRIR_{it} + B_6 logGFCF_{it} + \zeta_{it} \quad (8)$$

The natural logarithm is shown by log for easy and obvious interpretability. The study's final estimate is given in natural log form in Equation 8.

Justification of the model and estimation technique

The dynamic panel data model, as proposed by Blundell and Bond, is used to do the estimations, following their well-known work (1998). Arellano and Bover (1995) are the ones that first suggested this method of estimation. When time is limited relative to the quantity of panel data cross-sections, the dynamic panel data estimation technique model outperforms the alternatives. Because it is compatible and better suited in cases of weak instrumentation, it is even more favored. Compared to one-step GMM systems, the estimations developed using two-step GMM systems are more resilient and efficient, which is why they were used in this work. After the econometric analysis, the researchers used the Hansen test to correct for over-identification (Hansen, 2018). System GMM also outperforms competing models when it comes to handling heteroscedasticity and second-order serial correlation.

RESULTS AND DISCUSSIONS

Results

Table 3 displays the descriptive statistics for the study variables. Included in the study are a total of 462 observations, spanning 11 years and 42 cross-sectional nations. This means that there was enough observation in the current study to allow for data analysis and recommendation drawing.

It was determined that the average GDP per capita (logGDP) for SSA countries throughout the study period was 7.804562. Its range of values, from 7.757506 to 7.83392, shows that SSA countries' GDP per capita is not significantly different from one another. The correspondingly small standard deviation of 0.0219786 further confirms this.

In contrast, the average fiscal deficit (logFDT) as a proportion of GDP in sub-Saharan Africa is 1.580225, with extremes of 0.4934452 and 2.542717, respectively. The wide range of budget deficits among SSA nations is supported by the high standard deviation of 0.5582076. In terms of control variables, gross fixed capital formation in sub-Saharan Africa ranged from 2.673954 at its lowest point to 2.879956 at its highest point between 2011 and 2021. The average value of this variable was 2.788331. There are no significant differences in fixed capital formation between SSA nations, as shown by the result with a standard deviation of 0.067121. A real effective exchange rate of 4.594574 with a standard deviation of 0.0070481 was determined for SSA countries, while the average real interest rate

ranges from 1.90993 to 0.2273935. This demonstrates that across the research periods of 2011–2021, there were insufficient discrepancies in SSA. While 0.5582076 reflects large variances across panels, the average inflation rate for SSA nations over the research period was 2.272067.

Table 3

Findings from the study's descriptive statistics (2011–2021)

Variables	In shorts	Observation	Minimum	Maximum	Mean	Standard dev
GDP per capita	logGDP	462	7.757506	7.83392	7.804562	.0219786
Gross fixed capital formation	logGFCF	462	2.673954	2.879956	2.788331	.067121
Real effective exchange rate	logRER	462	4.586047	4.607192	4.594574	.0070481
Real interest rate	logRIR	462	1.676896	2.455032	1.90993	.2273935
Fiscal deficit	logFDT	462	.4934452	2.542717	1.580225	.5582076
Inflation	logINF	462	1.548588	3.194944	2.272067	.5194298

Source: *Authors computation from STATA 15* ***Note:*** *all variables are in log form.*

Table 4 displays the association between the studied variables. The results indicate a relationship between the study's variables. Accordingly, studies aiming to quantify the extent to which the budget deficit slows GDP growth are making progress in the right way. In particular, there is a negative correlation between SSA nations' GDP per capita and fiscal deficit, real effective exchange rate, and inflation, and a positive correlation with gross fixed capital formation (logGFCF) and real interest rate (logRIR). Between SSA nations' GDP per capita and fiscal deficit as a percentage of GDP (logFDT) over the study period, there was a considerable negative correlation (r=0.8146). The projected indication is confirmed by this.

Table 4

How the research variables' pairwise correlation coefficient turned out

Variable	logGDP	logGFCF	logRER	logRIR	logFDT	logINF
logGDP	1.0000					
logGFCF	0.1986	1.0000				
logRER	-0.1868	0.1758	1.0000			
logRIR	0.2601	0.5541	0.5831	1.0000		
logFDT	-0.8146	0.0860	0.2106	-0.0938	1.0000	
logINF	-0.3886	-0.6442	-0.4610	-0.7686	0.0288	1.0000

Source: *Authors computation from STATA 15* ***Note:*** *all variables are in log form*

Results of Panel Unit root tests

To ensure that the investigation did not produce any misleading regression results, two well-known panel unit root test procedures were used. One is the Hadri LM test for unit root, and the other is the Levin-Lin-Chu unit-root test. In order to look for unit roots in the panel data, both strategies use different null and alternative hypotheses. The following tables display the study's results:

Table 5

The unit-root test findings of Levin-Lin-Chu

Levin-Lin-Chu unit-root test at level				Levin-Lin-Chu unit-root test at first difference			
Variables	Statistics	P-value	Decision at I(0)	Variables	Statistics	P-value	Decision I(1)
logGDP	-12.1099	0.0000**	Stationary	logGDP	-18.9433	0.0000**	Stationary
logGFCF	-2.9138	0.0018**	Stationary	logIMP	-11.0701	0.0000**	Stationary
logRER	-12.4230	0.0000**	Stationary	logER	-23.0827	0.0000**	Stationary
logRIR	95.8608	1.0000	Non-stationary	logRIR	-8.3373	0.0000**	Stationary
logFDT	26.1285	1.0000	Non-stationary	logFDT	-8.6285	0.0000**	Stationary
logINF	-1.4510	0.0734*	Stationary	logINF	-29.0836	0.0000**	Stationary

Source: *Author's computation from Stata 15. * Shows significant variables at 10 percent while ** shows significant series at a 1 percent level of significance.*

Results from the Levin-Lin-Chu unit-root test, including level and first difference, are displayed in Table 5. As a result, we discover that all variables are stationary at the initial difference. However, logFDT and logRIR are found to be non-stationary at the level. Also, logINF is stationary at the 10% threshold of significance. We can move further with the study as non-stationary variables do not exhibit false regression and all variables are initially differentiable. As an alternate hypothesis to the null hypothesis that all panels have unit roots, the possibility that panels are stationary is explored in the Levin-Lin-Chu unit-root test.

Table 6

Results of Hadri LM test for unit root

Hadri LM test for unit root at level			Hadri LM test for unit root at first difference			
Variables	Statistics	P-value	Variables	Statistics	P-value	Decision
logGDP	7.2234	0.0000**	logGDP	-6.6272	1.0000	Stationary I(1)
logGFCF	25.2660	0.0000**	logIMP	-2.6845	0.9964	Stationary I(1)
logRER	-3.3057	0.9995	logER	-6.5434	1.0000	Stationary I(1)
logRIR	6.6408	0.0000**	logRIR	-0.7798	0.7823	Stationary I(1)
logFDT	-0.1551	0.5616	logFDT	-9.6798	1.0000	Stationary I(1)
logINF	13.8673	0.0000**	logINF	-0.1984	0.5786	Stationary I(1)

Source: *Author's computation from Stata 15. **Shows that P value is significant and we cannot reject the alternative hypothesis that says some panels contain a unit root.*

Table 6 shows that the Hadri LM test for unit root confirmed the results of the Levin-Lin-Chu unit-root test, giving us more assurance that our data is safe to use in our regression analysis. All panels are stationary according to the null hypothesis of the Hadri LM test for unit roots, however some panels do contain unit roots according to the alternative hypothesis. All of the research variables become stationary when translated to the first

difference, and a few of them, such logRER and logFDT, become stationary at a level. A rejection of the null hypothesis appears unlikely at first sight due to the results being similar to those of the Levin-Lin-Chu unit-root test. We can be confident that the output is free of non-spurious regression thanks to our two-stage GMM technique.

Results of the Hausman Test for Model Selection

The results of the Hausman test for model selection are shown in Table 7. The Pooled OLS model has a lag 1 coefficient of 1.796424 for the dependent variable, whereas the fixed effect model has a coefficient of 0.944916. In addition, the dependent variable's lag 1 coefficient, as determined by the two-step difference GMM, is 0.3562105. This means that between 0.944916 and 1.796424, there is a value of 0.3562105 that is smaller than 0.944916 < 1.796424. Because of this, system GMM is preferable to difference GMM for this research. The results of the Hausman model selection test led to the selection of system GMM in this study.

Table 7

Results of the Hausman test of model selection

Lagged GDP	Pooled OLS model	Fixed Effec Model	Difference GMM model(two-step)	Decision
L.logGDP	1.796424	0.944916	0.3562105	System GMM is more appropriate

Source: *Author's computation from STATA 15. L.logGDP shows the first lag of GDP, dependent variable of the study.*

Results of the short-run effect of fiscal deficit on economic growth in SSA countries

From 2011–2021, Table 7 shows the short-run impact of the budget deficit on SSA economic development. The study found that fiscal deficit as a percentage of GDP (logFDT), the relevant variable, positively and significantly affects the short-term economic growth of SSA nations. Additionally, the step-system GMM (1) finding showed that, all else being equal, there is a correlation between a percentage change in the fiscal deficit of SSA nations and a 0.036 percentage rise in economic growth over the research period. The three models that were calculated in Table 7 all yielded the same outcome. Since governments finance their budgets through deficit financing, this suggests that, in the near run, fiscal deficit boosts growth. Our study's results are in agreement with those of Awolaja and Esefo (2020).

The results show that SSA countries' economic growth is positively and considerably impacted by the first lag of GDP (L1.logGDP). With everything else being equal, a 1% shift in the first lag of GDP is linked to a 0.999% shift in economic growth for SSA nations. This was verified by the three models that were used to assess the result's consistency. The improved economic growth from previous year boosted this year's growth, as shown by this outcome.

Gross fixed capital formation (logGFCF) has a positive and statistically significant short-term effect on economic growth in SSA nations, according to the results of the two-step system GMM, which is one of the study's control variables. Consequently, from 2011 to 2021, there is a

correlation between a change in the gross fixed capital formation percentage of SSA nations and a 0.648 percent rise in economic growth, everything else being equal. The three models that were estimated to assess consistency all came to the same outcome. As a result, this proves that, at least in the near term, SSA's economy can benefit from investments in fixed capital formation. Batrancea et al. (2021) found similar results, which supports our work.

The results of the two-step system GMM show that the third control variable, the real effective exchange rate (logRER), has a negative and statistically significant correlation with the economic growth of SSA. When controlling for all other variables, a negative real exchange rate coefficient shows that economic growth in SSA slows by 0.522 percent for every 1% decrease in the real effective exchange rate. As shown in Table 5, this finding is statistically significant in Model 1 at the 1% level and in Models 2 and 3 at the 5% level. All estimated models agree with the study's conclusion. What this means is that the region's economic growth is stunted when the real effective exchange rate declines. This results agrees with what has recently been found by Rapetti (2020) and Zhu et al. (2022).

Also, all else being equal, a positive value for the real interest rate coefficient (logRIR) indicates that for every 1% change in the real interest rate, there is a 0.074 % drop in economic growth. At the 5% level of significance in Models 1 and 2, and at the 10% level in Model 3, the positive effect of real interest rate on the economic growth of SSA throughout the research period is statistically significant. Financial development in sub-Saharan Africa is low-slung, it suggests. This lends credence to the conclusion reached by Njie and Badjie (2021).

As a conclusion, the research shows that inflation (logINF) had a negative effect on economic growth in SSA nations during the studied period. After controlling for all other variables, the two-step generalized linear model (GMM) found that from 2011 to 2021, economic growth in sub-Saharan Africa (SSA) decreased by -0.035 percentage points for every percentage point change in the rate of inflation (consumer price index). All three columns of Table 5 showed the same result. Supporting the findings of Mandeya and Ho (2022) is this outcome. This suggests that the high (double digit) inflation rate in SSA nations is detrimental to economic development.

Table 8
Fiscal deficit's impact on SSA's economic development in the short run (2011–2021)

Variables of the study	System GMM result(two step)(1)	Fixed effect model(2)	Random effect model(3)
L1.logGDP	0.9996989*	0.990724*	0.944916 *
	(0.0700207)	(0.0728763)	(0.0770183)
logGFCF	0.648299*	0.6025781***	0.6391952**
	(0.0406292)	(0.0265254)	(0.015628)
logRER	-0.522711 *	-0.5088408**	0.511821**
	(0.0341499)	(0.0250919)	(0.0412028)
logRIR	0.0745543**	0.0742543**	0.0743407***
	(0.0387892)	(0.03833)	(0.013328)
logFDT	0.0365444*	0.03562105 *	0.03285422*
	(0.0023687)	(0.0162567)	(0.0596802
logINF	-0.0355858*	-0.3025781*	0.0357493*
	(0.0029494)	(0.0042565)	(0.0036234)

Table 8 continues …			
Constant	-43.3916*	-41.563546	
Model diagnostic results			
Number of observations	420	420	420
Wald chi2(7) Prob > chi2	0.000		1032.77
Prob > F		0.000	0.000
Number of groups	42		
Number of instruments	19		
F(41, 370)		1611.55	
Arellano-Bond test for AR(2)	0.593		
Hansen test Prob > chi2	0.346		

Source: Results obtained by the author using STATAT 15. The research's dependent variable is economic growth, denoted as logGD. *, **, and *** indicate significance levels of 1%, 5%, and 10%, respectively. The corrected standard errors for system GMM and standard errors for fixed and random effect models are shown in parenthesis.

Results of the model fitness

Table 8's bottom part shows that the two-step GMM estimated a larger number of groups (42) than instruments (19), which indicates that the model was constructed with a collapse option, which is desirable since it allows for the reduction of instrument numbers. In addition, the estimated model did not exhibit any second-order serial correlation, since the Arellano-Bond test for AR (2) calculated is 0.593, which is considered insignificant. The absence of autocorrelation in the first differenced errors indicates that our estimated model is accurate. Conversely, the Hansen test yields a value of 0.346, indicating that the estimated model is not over-identified.

Results of the long-run effect of fiscal deficit on economic growth in SSA countries

In Table 9, we can see how different factors affect GDP growth over the long term. Fiscal deficits impede economic growth in SSA nations throughout the studied period, according to the results. In contrast to the short-term outcome, the long-term data shows that SSA countries' economic development over the past few decades has declined by 0.013 percent for every one percentage point shift in budget deficit, everything else being equal. In the short term, the positive fiscal deficit coefficient is larger than the negative one, according to the two-step generalized method of moments (GMM) analysis. This means that the budget deficit is a drag in the long term, even though it can fund growth temporarily. Prior research by Kryeziu and Hoxha (2021) and Dauti and Elezi (2022) provided support for the findings of this study.

Over the long term, gross fixed capital formation still has a positive and substantial impact. Findings show that, all else being equal, sample SSA nations' economic growth can be enhanced by 0.469 percentage points for every percentage point change in long-term gross fixed capital formation. But long-term gross fixed capital formation coefficients are lower than short-term ones. As a result, governments in sub-Saharan African (SSA) areas are less likely to participate in capital

formation due to their large budget deficits. Aslan and Altinoz (2021) have already provided support for the results of this study.

Contrarily, real effective exchange rate (logRER) has a negative impact on economic growth for SSA African countries over the long term. It turns out that, everything else being equal, a 1% shift in real effective exchange rate degradation is linked to a 0.15% drop in economic development for SSA nations during the past few decades. On the other hand, a real effective exchange rate's negative impact is little when considering the big picture. The long-term impact on the real interest rate was also beneficial, but negligible. The analysis found that, everything else being equal, a one percent change in the real interest rate is linked to a 0.073% boost in economic growth over the long term. The findings of Rapetti (2020) and Shaukat and Khan (2019) are supported by this outcome.

As a conclusion, inflation has a beneficial but negligible impact on the long run. According to the long-run coefficient produced by the two-step approach GMM, SSA countries' economic growth over the last decade has decreased by 0.059 percent for every percentage change in inflation, all else being equal. This demonstrates that inflation has a negative impact on economic growth in SSA countries over the long and short term. Our study's findings are in agreement with those of Mandeya and Ho (2022).

Table 9

Fiscal deficit's impact on SSA's GDP growth over the long term (2011–2021)

Variable	Variables	Coefficients	The GMM long-run generation command
Gross fixed capita formation	logGFCF	0.4699954*	nlcom (_b[logGFCF])/(1- _b[L.logGDP])
Real effective exchange rate	logRER	-0.1158054	nlcom (_b[logRER])/(1-_b[L.logGDP])
Real interest rate	logRIR	0.073553	nlcom (_b[logRIR])/(1-_b[L.logGDP])
Fiscal deficit	logFDT	-0.0137324*	nlcom (_b[logFDT])/(1-_b[L.logGDP])
Inflation	logINF	-0.0591008	nlcom (_b[logINF])/(1-_b[L.logGDP])

Source: The author used STATA 15 to calculate the significance levels, which are denoted by *, **, and ***, respectively, for 1%, 5%, and 10%. Everything is expressed as a logarithm.

CONCLUSIONS

The impact of fiscal deficit on economic growth was investigated in this study, which focused on 42 sub-Saharan African nations chosen according to the availability of data. Using two-step system GMM estimation methodologies, the study estimated the outcome using dynamic panel data that covered the years 2011–2021. An analysis was conducted to calculate the fiscal deficit as a percentage of GDP. Tax income was taken into account along with general government final consumer spending.

Based on the findings of the studies' two-step system GMM, fiscal policy has different effects in the short and long run. Despite the fact that budget deficits impeded economic

growth in SSA nations over the long term, our data showed that they boosted growth in the near term. This suggests that budget deficits affect economic growth in SSA nations differently depending on the time of day. While the neoclassical theory of fiscal deficit holds water in the long run, Keynesian theory holds water in the short run when it comes to the impact of deficit spending on GDP growth in SSA nations.

The two-stage GMM method predicts that real effective exchange rates and inflation will slow economic growth in sub-Saharan Africa (SSA) in the near future. The negative effects of inflation and the real effective exchange rate are temporary. But their impacts are small in the grand scheme of things. Conversely, the research indicated that in the short run, the drivers of economic growth in the SSA region are the real interest rate and gross fixed capital creation. In contrast to the large influence of gross fixed capital formation, the long-term beneficial effect of real interest rates on economic growth in sub-Saharan African countries is determined to be minimal.

Recommendations

So, policy-wise, it follows that SSA nations should put their borrowed money to good use by putting it into projects with high return-on-investment potential and high gross fixed capital creation rates. Additionally, SSA nations should work to lower their total budget deficits, as this causes them to incur additional debt as a result of deficit financing, which in turn causes SSA nations to increase spending on developmental projects.

The impact of other variables on SSA nations might be investigated in future studies by expanding the range of indicators. It is worth noting that SSA countries with varying income levels could provide intriguing comparisons. Third, the analysis period was over eleven years long, which is in line with what the system requires. Additional intriguing discoveries regarding the connection between fiscal deficit and economic growth in SSA countries could be uncovered in future studies that extend the time window to multiple decades.

As is typical with any scientific inquiry, this one does have certain limits. As a first point, just 42 nations from sub-Saharan Africa were included in the sample. The correlation between government spending and GDP growth might be further explored in future research with a more extensive sample size. Secondly, there were just a handful of fiscal deficit and GDP growth-related variables included in our analysis.

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DECLARATION

There is no conflict of interest in this study.

DATA AVAILABILITY STATEMENT

All data are available from the corresponding author upon request.

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