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MACROECONOMIC DETERMINANTS OF FISCAL POLICY IN EAST AFRICA: A PANEL CAUSALITY ANALYSIS

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Abstract

This study investigates the dynamic causality linkages between fiscal deficits and selected macroeconomic indicators in a panel of five East African countries. The research design is based on panel cointegration tests, panel cross-section dependence tests, panel error correction-based Granger causality tests, and panel impulse response functions. Results show that there is long run feedback causality among fiscal deficits and each of the variables that include: real GDP growth, current account balance, interest rates, inflation, grants, and debt service. Short run Granger causality dynamics indicate that there is feedback causality between fiscal deficits and GDP growth; no causality between fiscal deficits and inflation; no causality between fiscal deficits and current account; no causality between fiscal deficits and interest rates; feedback causality between fiscal deficits and grants; and no causality between fiscal deficits and debt service. Impulse response functions show positive and significant impacts of current account balance, inflation, and grants; negative and significant impacts of real GDP growth and lending rates; and insignificant effects of debt service. In the context of the East African Community's aspirations to achieve convergence on key macroeconomic targets, including the fiscal deficit, this research provides novel insights on fiscal policy determinants and causality dynamics.

Keywords: Fiscal deficits, Granger causality, impulse response; panel data, East Africa

JEL: E62; E63; H61; H62; H63

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1. Introduction

There is continuing interest among scholars and policy makers in the roles that fiscal policy plays in the mobilization and allocation of resources necessary to facilitate realization of desired economic outcomes consistent with a country's development agenda (Moreno-Dodson, 2012). However, many developing and emerging market economies have experienced rising budget deficits in recent years, with growing concerns over implications for future fiscal sustainability, debt, and macroeconomic stability (Kose *et al*., 2021). More recently, the COVID-19 pandemic has precipitated large macroeconomic imbalances, leading to loss of fiscal sustainability across many countries (Burger and Calitz, 2021; Makin and Layton, 2021; Brodeur *et al*. 2021).

While the literature on the macroeconomic determinants of fiscal deficits is voluminous, however, findings are inconclusive (Saleh and Harvie, 2005). In addition, existing studies have tended to focus on single country case studies, limiting generalization of findings to a wider range of country contexts. While weak growth and low interest rates explained the rising fiscal deficits in the pre COVID-19 period (World Bank, 2019a), recent experiences suggest more nuanced developments, necessitating new and comprehensive analyses of the determinants of fiscal deficits. Indeed, evidence shows that in comparison to previous periods, the COVID-19 pandemic has precipitated disproportionately larger fiscal deficits and macroeconomic effects (Makin and Layton, 2021; Alberola *et al*., 2021). At the same time, if rising fiscal deficits result in unsustainable accumulation of debt, then new vulnerabilities would emerge with implications for growth and macroeconomic management (IMF, 2020a).

The purpose of this paper is to investigates the dynamic causality linkages between fiscal deficits and selected macroeconomic indicators. We examine these issues in five East African Community

(EAC) member countries, namely: Burundi, Kenya, Rwanda, Tanzania, and Uganda. The analysis excludes South Sudan due to significant data limitations. The EAC is considered one of the most dynamic African regional economic communities with aspirations of becoming a monetary union (Drummond *et al*., 2015). Within the regional economic integration framework, EAC member countries agreed upon macroeconomic convergence targets that include: inflation, fiscal deficits, debt, and interest rates. Specifically, the target for fiscal deficits is 3 percent of GDP, with the aim of maintaining gross public debt levels below 50 percent of GDP in net present terms (Ltaifa, Yabara, and Willias, 2015). However, attaining converge may experience challenges as fiscal deficits have been rising over the past decade leading to build up of public debt across the region (IMF, 2018). In addition, emerging vulnerabilities including those related to the COVID-19 pandemic that has affected growth and led to higher financing needs may derail progress amidst heightened global uncertainty (African Development Bank, 2020; IMF, 2020b).

This study contributes to two strands of the literature. First, the study contributes to the literature on the macroeconomic determinants of fiscal deficits. Second, the study contributes to the literature on the macroeconomic effects of fiscal deficits in regional economic communities in developing economies. As has been argued by Papageorgiou, Michaelides, and Tsionas (2016), fiscal policy is probably the most important tool in dealing with country specific fluctuations in a regional economic community. However, devising requisite responses requires a clear understanding of the determinants of fiscal policy and their dynamic causality linkages.

The rest of the paper is organized as follows: section two provides a review of the literature and develops a simple analytical framework. Methods are discussed in section three. Section four presents the results. Section five provides a brief discussion. Section six concludes.

2. Literature review

2.1 The determinants of fiscal deficits

From a theoretical perspective, the literature espouses four views that explain fiscal policy outcomes. The Ricardian equivalence theory postulates that fiscal deficits are neither determined nor yield any macroeconomic effects in the long run (Barro 1989; Seater 1993). The Keynesian theoretical view links fiscal deficits to investment and growth (Bernheim, 1989; Eisner, 1989). The neoclassical theory describes budget deficits as arising from market lending and borrowing decisions in inter-temporal optimization problems (Bernheim, 1989). This theoretical exposition gives rise to the twin-deficit hypothesis which describes a causal linkage between a country's fiscal and current account balances (Kim and Roubini, 2008). The fourth view describes fiscal deficits as arising out of political economy contestations (Alesina and Perotti, 1995; Eslava, 2011).

The empirical literature examining the determinants and effects of fiscal deficits using dynamic causality models is scant but evolving. Employing the Gregory and Hansen cointegration methodology, as well as asymmetric cointegration techniques, Trachanas and Katrakilidis (2013) showed that the twin deficits hypothesis holds for Portugal, Ireland, Greece and Spain. These findings are consistent with research by Xie and Chen (2014) who used bootstrap panel Granger causality methods to show that there is bi-directional causality between the current account deficit and the government budget deficit for eleven OECD countries. However, these results are contrasted by among others, Sobrino (2013), who used quarterly data and Granger causality methods to reject the twin deficits hypothesis and instead show that current account balances cause fiscal deficits in Peru.

Research examining the dynamic nexus between fiscal deficits and inflation has provided useful insights. Catao and Terrones (2005) investigated the dynamic linkages among fiscal deficits and inflation in a panel of 107 countries over 1960 – 2001. Using the Mean Group and Pooled Mean Group estimators within the panel ARDL framework, results showed that budget deficits are significant drivers of inflation among high-inflation and developing country groups, but not among low-inflation advanced economies. These results are consistent with a wide range of literature that shows the positive dynamic relationship between budget deficits and inflation (Bhat and Sharma, 2020; Nguyen, 2015; Lin and Chu, 2013).

Investigations of the dynamic relationship among fiscal deficits and real economic growth has attracted much attention in the literature. Afonso and Jalles (2014) examined the causal dynamics between fiscal policy and economic growth. Using panel Granger causality methods on a large panel of 155 countries for the period 1970 to 2010, they uncover strong causality running from fiscal policy (government expenditures) to per capita GDP, but no evidence to support Granger causality from per capita GDP to government expenditure. More recently, Magazzino (2016) examined the relationship among fiscal variables and economic growth in panels of economic groups in Sub-Saharan African countries using annual data for the period 1980 – 2011, finding a positive relationship between the two variables. Specifically, a 1 percent point reduction in economic growth would widen budget balances by about 0.18 percentage points for WAEMU countries.

Research findings on the dynamic nexus between budget balances and interest rates has been inconclusive. Vamvoukas (2002) used a combination of seemingly unrelated regressions (SUR) and impulse response functions and concluded that bidirectional causality exists between budget deficits and interest rates using data on a small open economy. Cheng (1998) applied the two step Engle-Granger causality methodology but found no causality between fiscal deficits and long-term interest rates in Japan. However, Cheng (1998) uncovered feedback causality between fiscal deficits and short-term interest rates using Hsiao's approach to causality testing. Uwilingiye and Gupta (2009) concluded that budget deficits Granger cause interest rates in South Africa with no feedback confirmed in a multivariate vector error correction framework. However, Garcia and Ramajo (2004) did not find evidence to support validity of causality between budget deficits and interest rates in Spain using error correction methods within the ARDL framework.

The literature shows that access to grants and loans has important implications for fiscal policy (Morrissey, 2015). There has consequently emerged an interesting thread of literature examining the fiscal effects of aid in developing countries. Within this realm, Bwire *et al*. (2017a) examined the dynamic causal links among aid and fiscal variables in Uganda, over the period 1972 to 2014 using a cointegrated vector autoregressive (CVAR) model with both annual and quarterly data. Importantly, they show that these variables form a stable long run cointegrated relationship, implying causality in at least one direction. These findings are consistent with recent analyses on Ethiopia (Mascagni and Timmis, 2017), Rwanda (Bwire et al., 2017b), and Ghana (Osei, Morrissey, and Lloyd, 2005).

More recent analyses have focused on the determinants of fiscal policies in the wake of the COVID-19 crisis. Within this realm, Benmelech and Tzur-Ilan (2020) showed that low-income countries with poor credit ratings had smaller fiscal space to respond more meaningfully to the crisis than high income countries. In Africa, the fiscal effects of the pandemic are estimated to be especially severe with estimates indicating that fiscal deficits doubled in 2020 leading to increased debt burdens (African Development Bank, 2021). For many countries, however, the pandemic exacerbated an already precarious fiscal position, with depleted buffers offering limited space to maneuver, leading to loss of fiscal sustainability (Burger and Calitz, 2021; Makin and Layton, 2021; Brodeur et al. 2021). To restore fiscal sustainability, governments may consider growth enhancing budget-neutral reallocation of expenditures, reliance on external grants and concessional lending, while avoiding inflationary financing of the budget (Loayza and Pennings, 2020).

2.2 Analytical framework

This study proposes a framework in which fiscal deficits are determined through the interaction of activities of households, government, and external sector developments.

The household sector

The current study presents a representative household that maximizes an inter-temporal utility function that is dependent on the consumption of a homogenous good, defined in equation (1).

$$\sum_{t=0}^{\infty} \beta^t U(C_t) \qquad (1)$$

Where C_t refers to a consumption basket and β^t is the subjective discount factor, such that $(0 < \beta < 1)$, i.e. β is strictly positive (non-negative) and less than unity. U defines a utility function that is assumed to be strictly increasing and concave in consumption.

Following earlier work that modelled household intertemporal budget constraints in general models for fiscal deficit determination, the study makes the following assumptions: (i) that the household is endowed with a positive quantity of a good Y_t; (ii) that the household pays taxes τ_t and can either consume or transfer the after tax endowment over time by money holdings or through risk-free bonds (Catao and Terrones, 2005). Therefore, the household's inter-temporal budget constraint can be constructed as defined in equation (2).

$$C_t + \frac{b_{t+1}^p}{R_t^*} + \frac{m_{t+1}}{p_t} = y_t - \tau_t + b_t^p + \frac{m_t}{p_t} \qquad (2)$$

Where C_t is household consumption defined as previously; b_t^p represents the real value of household-held risk-free bonds; m_{t+1} represents household's holding of money balances; τ_t is a lumpsum tax at period t; p_t is the price level and R_t^* is the international real gross rate of return on one-period bonds. Rearranging equation (2) above, and defining inflation as

$\frac{m_{t+1}}{p_t} - \frac{m_t}{p_t} = \pi_t$ or a change in prices, and $\frac{b_{t+1}^p}{R_t^*} - b_t^p = \Delta\frac{b_t^p}{R_t^*}$ defined as the real change in household holdings of real bonds, we can then define the household budget constraint as shown in equation (3). In this postulation, for a given level of income, consumption, and taxes, the household budget deficit can be defined as a function of holdings of real bonds and inflation. Please note that the stock of bonds that a household can hold at any time, t can be expressed as a function of real disposable income and interest rate (or the return on bonds), such that:

$$\frac{b_{t+1}^p}{R_t^*} - b_t^p = \Delta\frac{b_t^p}{R_t^*} = f(i_t, \pi_t) \qquad (3)$$

Substituting equation (3) into equation (2) yields the optimal household budget constraint which can be thought of as a function of interest rates, defined as the return on government issued debt/bonds, i_t and inflation, π_t as shown in equation (4)

$$y_t - C_t - \tau_t = f(i_t, \pi_t) \qquad (4)$$

The government sector

In each period, government fulfils its budgetary obligations either by collecting taxes, issuing debt, running down reserves, or printing money. Governments can also receive transfers or grants in the form of Overseas Development Assistance (ODA). Drawing from the public finance and fiscal sustainability analysis literature (Blanchard, 1985; Taylor et al. 2012), the government inter-temporal budget constraint can be defined as:

$$D_t = D_{t-1} + iD_{t-1} - B_t - R_t \qquad (5)$$

Where D_t is the stock of public debt that includes both domestic and foreign debt; i is the average nominal interest rate; B_t is the budget balance defined as the difference between T_t and primary expenditure S_t; and R_t is access to grants. Assuming that nominal GDP growth is g, i.e. $GDP_t = (1+g) * GDP_{t-1}$, equation 5 can be divided by GDP_t and rearranged to obtain equation (6).

$$\Delta d_t = \left[\frac{(i-g)}{(i+g)}\right] d_{t-1} - (t_t - s_t) - r_t \qquad (6)$$

Rearranging equation (6) above yields the government budget deficit as a function of GDP growth rate, interest rates, debt, and access to foreign grants as shown in equation (7). Specifically, equation (7) shows that budget deficits will be higher, the higher are interest rates; the lower is growth; the higher is debt (or debt servicing flows), and the higher are grants.

$$(t_t - s_t) = \left[\frac{(i-g)}{(i+g)}\right] d_{t-1} - \Delta d_t - r_t \qquad (7)$$

The external sector

The current account balance reflects a country's external position with the rest of the world. In this respect, the Mundell-Fleming model, based on the seminal works of Mundell (1963) and Fleming (1962), provide a useful starting point and building blocks for the relationship between fiscal policy and the external sector. Building on the Mundell-Fleming framework, Abbas *et al.*

(2011) provide a framework in which fiscal policy and the current account are represented using the following identity in equation 8 below:

$$ca_t = tb_t + tp_t \equiv (S_{pt} - I_{pt}) + (S_{gt} - I_{gt}) \qquad (8)$$

Where ca_t represents the current account; tb_t is the trade balance; $tb_t$are transfer payments. S_{pt} and I_{pt} are private savings and investment respectively; S_{gt} and I_{gt} are government savings and investment respectively. In the absence of government transfers to the private sector, $S_{gt} - I_{gt}$ is equivalent to the fiscal balance. In this respect, therefore, the budget balance, b_t, can be expressed as a function of the current account balance ca_t and the private savings-investment gap $(S_{pt} - I_{pt})$, such that:

$$b_t = f(ca_t, S_{pt} - I_{pt}) \qquad (9)$$

Drawing from various theoretical underpinnings, including: the accelerator principle and the saving and investment literature (Samuelson, 1939); intertemporal saving and investment models (Abel and Blanchard, 1983); and the intertemporal postulation of current account dynamics (Obstefeld and Rogoff, 1995), savings and investments are related to the GDP growth rate, g_t, and interest rates, i_t. Thus equation (9) can be reformulated in terms of the current account, ca_t; real GDP growth rate, g_t, and interest rates, i_t as shown in equation (10).

$$b_t = f(ca_t, i_t,\ g_t) \qquad (10)$$

The general model

Combining the determinants of budget balances from the household, government, and external sectors into a single model yields the following general model (equation 11) that provides a useful framework for carrying out an empirical evaluation of the determinants of fiscal deficits in a given country:

$$b_t = f(i_t, g_t, d_t, r_t, ca_t, \pi_t) \quad (11)$$

Hypotheses

This general model specifies the determinants of fiscal deficits as: interest rates, real GDP growth rate, debt (or debt service), grants, current account balance, and inflation. Following the general model specified in equation (11), the following testable hypotheses are investigated: **H1**: Current account does not Granger cause fiscal deficits; **H2:** Real GDP growth does not Granger cause fiscal deficits; **H3:** Inflation does not Granger cause fiscal deficits; **H4:** Interest rate does not Granger cause fiscal deficits; **H5:** Grants does not Granger cause fiscal deficits; **H6:** Debt service does not Granger cause fiscal deficits.

3. Data, Research Design, and Analytical Procedures

3.1 Data

The study constructed a balanced panel dataset, spanning 38 years during 1980 – 2017, from annual time series data for each of the five East African countries considered in this study. Specifically, the study considers the following variables, chosen as appropriate from a review of extant literature as well as well availability of full and consistent data for all the countries: fiscal deficits (% GDP), current account balance (% GDP), real GDP growth; interest rates; debt service (%GDP) and grants (% GDP). Fiscal and current account balances data are sourced from the IMF's World Economic Outlook (IMF, 2019). Real GDP growth rates, interest rates, public debt service, grants, and inflation data are sourced from the World Bank's (2019b) World Development Indicators (WDI). Table 1 summarizes the variables used in this study, including their definitions and sources. The descriptive statistics are provided in table 2.

Table 1: Definitions and sources of variables

Variable	Name	Definition	Source
Fiscal deficit	FDEF	The difference between revenue and expenditure, excluding grants and interest payments, expressed as a percentage of GDP	IMF (2019)
Interest rate	LRATE	Return on government issued debt or bonds	World Bank (2019b)
Real GDP growth	RGDP	Year-on-year change in a country's real GDP, expressed as a percentage.	World Bank (2019b)
Debt service	DEBT	The percentage debt service of expressed as a percentage of GDP in any given year	World Bank (2019b)
Grants	GRANT	Official bilateral and multilateral non-repayable loans received expressed as a percentage of GDP	World Bank (2019b)
Current account balance	CAB	The difference between a country's value of exports and imports of goods, services and transfer payments, expressed as a percentage of GDP	IMF (2019)
Inflation rate	INFLATION	Year-on-year change in a country's consumer price index (2010=100), expressed as a percentage	World Bank (2019b)

Table 2: Descriptive statistics

	Mean	Std dev	Min	Max	N
Fiscal deficit, % GDP	-9.332	6.035	-33.100	0.400	190
Current account, % GDP	-5.427	5.183	-26.230	11.420	190
Real GDP growth, %	4.143	5.384	-41.890	24.540	190
Interest rates, %	18.917	6.438	10.580	42.830	190
Inflation, %	17.457	29.018	-2.420	215.400	190
Debt service, % GDP	2.740	2.578	0.210	12.990	190
Grants, % GDP	4.476	4.529	0.090	22.645	190

3.2 Research Design

Panel-based Cross-section Dependence Tests

As the literature clearly indicates, panel-data models are likely to be affected by cross-section dependence in their error terms. This could be owing to several factors, including idiosyncratic pairwise dependence in the disturbances, the presence of common shocks, unobserved components, and spatial dependence (Pesaran, 2004; Baltagi, 2005; Anselin, 2001). Cross-section dependence has been demonstrated to result in a significant decrease in estimation efficiency, resulting in the potential loss of the usefulness of panel estimators over single-equation least-squares methods (Phillips & Sul, 2003).

To avoid inconsistent parameter estimation and to ensure that cross-country correlations are not present, four cross-section dependence tests have been conducted in this study. These are the Pesaran's (2004) cross-dependence (CD) test, the Breusch-Pagan LM test, the Pesaran scaled LM test, and the bias-corrected scaled LM test. The general null hypothesis in these tests is that the errors for the estimated panel regression are not correlated (i.e., enabling to test the hypothesis that there is no cross-section dependence in the panel data).

All test results in Table 3 show the existence of non-zero cross-section means in the data for all variables. This means that the null hypotheses of no cross-section dependence in the individual panel variables are rejected. This study concludes that our individual panel data series have cross-section dependence based on the Breusch-Pagan LM test, Pesaran CD test, Pesaran scaled LM test, and bias-corrected scaled LM tests.

The presence of cross-sectional dependence in the panel data variables suggests that an economic shock in one of the countries in the panel is likely to be transmitted to other countries. This is not surprising given that the countries under study are in a regional economic community. Therefore, regional integration may facilitate the propagation of cross-dependence in the transmission of shocks. There is thus a high probability for the first-generation panel unit root tests to reject the null hypothesis of a unit root.

Table.3: Cross-section dependence test results

Variable	Pesaran CD		Breusch-Pagan LM		Pesaran scaled LM		Bias-corrected scaled LM	
	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
DEFICIT	1.791	0.073	38.588	0.000	6.381	0.000	6.318	0.000
LRATE	5.064	0.000	84.187	0.000	16.586	0.000	16.526	0.000
log (RGDP)	5.227	0.000	250.253	0.000	53.722	0.000	53.659	0.000
DEBT	5.073	0.000	90.676	0.000	18.039	0.000	17.977	0.000
GRANT	6.353	0.000	66.931	0.000	12.730	0.000	12.667	0.000
CAB	5.924	0.000	61.242	0.000	11.458	0.000	11.395	0.000
log (DEFL)	18.766	0.000	353.904	0.000	76.899	0.000	76.836	0.000

Notes: (i) Tabulated are test statistics and respective probability values; (ii) For all cross-section dependency tests the null hypothesis is specified as follows: Ho: No cross-section dependence (correlation); (iii) Cross-section means were removed during computation of correlations; (iv) All test results show non-zero cross-section means in the data for all variables.

Panel Unit Root Tests

Given that the panel cross-sectional dependence tests show the presence of cross-sectional dependence, there is a high probability for the first-generation panel unit root tests to reject the null hypothesis of a unit root. Therefore, this study used two second-generation panel unit root tests proposed by Pesaran (2007) and Bai and Ng (2004). These tests were used in addition to the first-generation panel unit root tests that included Levin-Lin-Chu, Im-Pesaran-Shin, and the Fisher-type (ADF) tests. Results of the first-generation tests provided in Table 4 show that all variables included in the study are non-stationary in levels, but stationary in first differences. Therefore, all variables are non-stationary in levels, or are integrated of the first order, I(1).

Table 4: First generation panel unit root tests

Variable	Levin–Lin–Chu		Im-Pesaran-Shin		Fisher type (ADF)		Order of integration
	In levels	In first differences	In levels	In first differences	In levels	In first differences	
DEFICIT	-0.714	-9.899***	-1.257	-10.947***	14.864	111.244***	I (1)
LRATE	-0.585	-4.601***	-1.065	-5.871***	12.485	53.610***	I (1)
log (RGDP)	0.756	-4.160***	2.908	-5.162***	1.061	47.616***	I (1)
DEBT	-0.241	-8.768***	0.137	-8.394***	9.185	81.737***	I (1)
GRANT	-0.386	-9.895***	-1.378	-8.990***	14.825	89.530***	I (1)
CAB	-0.223	-8.004***	-1.097	-9.828***	14.439	98.421***	I (1)
log (DEFL)	-0.513	-4.016***	-0.424	-2.172**	14.933	21.723**	I (1)

Notes: (i) Tabulated are test statistics; (ii) *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively; (iii) For all unit root tests the null hypothesis is specified as follows: Ho: Panels contain unit roots; (iv) All tests are carried out including individual intercept and trend

Since the cross-sectional dependence tests rejected the null hypothesis of cross-section independence in all the variables, additional unit root tests are estimated using the second-generation panel unit root tests. This step is important because the second-generation unit root tests account for the presence of panel cross-sectional dependence in the series. Therefore, this study applies two second-generation unit root tests, based on i) Pesaran's (2007) cross-sectionally augmented IPS (CIPS) panel unit root test, and ii) Bai and Ng's (2004) Panel Analysis of Non-stationarity in Idiosyncratic and Common Components (PANIC) test. The results of the second-generation panel unit root tests are provided in Table 5 and they show that all that the variables have unit roots, in other words - they follow I(1) processes. This confirms that all variables included in the study are non-stationary in levels, but stationary in first differences.

Table 5: Second generation panel unit root tests

Variable	Pesaran – CIPS		Bai and Ng – PANIC		Order of integration
	In levels	In first differences	In levels	In first differences	
DEFICIT	-2.188	-5.679***	-0.616	-4.440***	I (1)
LRATE	-2.593	-6.297***	-0.207	-3.745***	I (1)
log (RGDP)	-0.087	-3.782***	-1.659	-3.753***	I (1)
DEBT	-1.327	-4.657***	-1.807	-4.657***	I (1)
GRANT	-2.579	-6.032***	-0.205	-7.788***	I (1)
CAB	-2.465	-6.142***	-1.756	-4.701***	I (1)
log (DEFL)	-2.468	-3.089***	-0.999	-2.424**	I (1)
TAX	-2.473	-5.483***	-1.456	-3.909***	I (1)
EXPEND	-2.099	-3.923***	-1.053	-3.971***	I (1)

Notes: (i) Tabulated are test statistics; (ii) ** and *** denote statistical significance at the 5% and 1% levels, respectively; (iii) For all unit root tests the null hypothesis is specified as follows: Ho: Panels contain unit roots; (iv) All tests are carried including individual intercept and trend

Panel Cointegration Tests

This study utilizes three panel cointegration tests. First, two first-generation cointegration tests are performed, based on Pedroni (1999, 2004) and Kao (1999). In addition to these two tests, a third test, based on Westerlund's (2007) second generation test that provides consistent results in the presence of cross section dependence among the panel data series, is performed. The common null hypothesis across these tests is that the variables do not form a stable or stationary long-term relationship. In other words, the study variables are not cointegrated. The alternative hypothesis of the Kao and Pedroni tests is that the variables form a stable and stationary long-term relationship that is consistent with cointegration in all panels. In one version of the Westerlund test, the alternative hypothesis is that the variables are cointegrated in some of the panels. In another version of the Westerlund test, the alternative hypothesis is that the variables are cointegrated in all the panels.

Table 6 shows the results from the Pedroni tests in Panels A and B, indicating that the panel data series are cointegrated in both panels. The results of the Kao (1999) test are presented in Table 7, and they provide strong support for the alternative hypothesis of cointegration in all panels. The results from the second-generation Westerlund panel cointegration tests are provided in Table 8 and confirm cointegration for both the linear and nonlinear models estimated in this study.

Table 6: Panel cointegration tests

Panel A: Pedroni cointegration tests: Alternative hypothesis: individual AR coefs. (within-dimension)		
	Statistic	Prob
Panel v-Statistic	-0.039	0.484
Panel rho-Statistic	-1.577	0.057
Panel PP-Statistic	-5.601	0.000
Panel ADF-Statistic	-3.141	0.000
Panel B: Pedroni cointegration tests: Alternative hypothesis: individual AR coefs. (between-dimension)		
	Statistic	Prob
Group rho-Statistic	0.861	0.805
Group PP-Statistic	-6.221	0.000
Group ADF-Statistic	-5.272	0.000

Table 7: Kao cointegration tests

	Statistic	Prob
Modified Dickey-Fuller t	-6.546	0.000
Dickey-Fuller t	-4.365	0.000
Augmented Dickey-Fuller t	-4.209	0.000

Table 8: Westerlund cointegration tests

Test	Test statistic	Z-value	p-value	Robust p-value
G_T	-3.957	-2.609	0.005	0.000
G_α	-23.945	-1.729	0.042	0.000
P_T	-8.885	-2.092	0.002	0.000
P_α	-26.96	-3.389	0.000	0.000

3.3 Analytical Procedures

Multivariate Granger causality tests

Investigations of the dynamic causal relationship among variables can be traced to the seminal work of Granger (1969) who developed a bivariate causality testing framework based on time series data. More recently, Dumitrescu and Hurlin (2012) developed a procedure for implementing pairwise Granger causality tests in panel datasets. In this framework, a variable, say Y_{it} is said to Granger cause another variable, say, Z_{it} if, given the past information or values of Z_{it}, past values of Y_{it} are useful in predicting Z_{it}. A convenient way for testing Granger causality involves regressing Z_{it} on its owned lagged values and on lagged values of Y_{it} and test for the joint significance of the estimated coefficients on Y_{it}. If the coefficients on Y_{it} are non-zero, then we can conclude that Y_{it} Granger causes Z_{it}, that is past information in Y_{it} can be used to predict Z_{it}.

However, pairwise Granger causality testing has been criticized for disregarding the short run adjustment mechanisms that exist in level relationships. Therefore, these tests could suffer significant misspecification biases unless the lagged error correction terms are included if the variables are cointegrated (Granger, 1988). Importantly, these tests do not allow testing for both short run and long run Granger causality in a single framework. Moreover, these tests might suffer omitted variable bias if other control variables are not included. Multivariate Granger causality testing allows us to circumvent such shortcomings by including, as additional control variables, the differenced lagged values of all variables under consideration, in a panel ARDL error correction framework.

Following Engle and Granger (1987), we use a two-step procedure to implement multivariate panel Granger causality testing. The first step involves estimating a pooled long run model in levels to generate the estimated residuals. This is done by estimating a system of models represented in equation 12.

$$FDEF_{it} = \alpha_0 + \alpha_{1t}LRATE_{it} + \alpha_{2t}RGDP_{it} + \alpha_{3t}DEBT_{it} + \alpha_{4t}GRANT_{it} + \alpha_{5t}CAB_{it} + \alpha_{6t}INFLATION_{it} + \varepsilon_{it} \quad (12)$$

The second step involves using the lagged residuals from equation (1) above as the error correction terms in a panel ARDL system of equations used to test for both short run and long run multivariate Granger causality. This system of models are expressed in equations (13) – (19).

$$\Delta FDEF_{it} = \mu_i + \sum_{j=1}^{p} \alpha_{11,ij}\Delta FDEF_{i,t-j} + \sum_{j=0}^{q} \alpha_{12,ij}\Delta LRATE_{i,t-j} + \sum_{j=0}^{q} \alpha_{13,ij}\Delta RGDP_{i,t-j} + \sum_{j=0}^{q} \alpha_{14,ij}\Delta DEBT_{i,t-j} + \sum_{j=0}^{q} \alpha_{15,ij}\Delta GRANT_{i,t-j} + \sum_{j=0}^{q} \alpha_{16,ij}\Delta CAB_{i,t-j} + \sum_{j=0}^{q} \alpha_{17,ij}\Delta INFLATION_{i,t-j} + \beta_{1i}ECT_{i,t-1} + \varepsilon_{it} \quad \textbf{(13)}$$

$$\Delta LRATE_{it} = \mu_i + \sum_{j=1}^{p} \alpha_{21,ij}\Delta LRATE_{i,t-j} + \sum_{j=0}^{q} \alpha_{22,ij}\Delta FDEF_{i,t-j} + \sum_{j=0}^{q} \alpha_{23,ij}\Delta RGDP_{i,t-j} + \sum_{j=0}^{q} \alpha_{24,ij}\Delta DEBT_{i,t-j} + \sum_{j=0}^{q} \alpha_{25,ij}\Delta GRANT_{i,t-j} + \sum_{j=0}^{q} \alpha_{26,ij}\Delta CAB_{i,t-j} + \sum_{j=0}^{q} \alpha_{27,ij}\Delta INFLATION_{i,t-j} + \beta_{2i}ECT_{i,t-1} + \varepsilon_{it} \quad \textbf{(14)}$$

$$\Delta RGDP_{it} = \mu_i + \sum_{j=1}^{p} \alpha_{31,ij}\Delta RGDP_{i,t-j} + \sum_{j=0}^{q} \alpha_{32,ij}\Delta FDEF_{i,t-j} + \sum_{j=0}^{q} \alpha_{33,ij}\Delta LRATE_{i,t-j} \quad \textbf{(15)}$$

$$+\sum_{j=0}^{q}\alpha_{34,ij}\Delta DEBT_{i,t-j}+\sum_{j=0}^{q}\alpha_{35,ij}\Delta GRANT_{i,t-j}+\sum_{j=0}^{q}\alpha_{36,ij}\Delta CAB_{i,t-j}+\sum_{j=0}^{q}\alpha_{37,ij}\Delta INFLATION_{i,t-j}$$

$$+\beta_{3i}ECT_{i,t-1}+\varepsilon_{it}$$

$$\Delta DEBT_{it}=\mu_i+\sum_{j=1}^{p}\alpha_{41,ij}\Delta DEBT_{i,t-j}+\sum_{j=0}^{q}\alpha_{42,ij}\Delta FDEF_{i,t-j}+\sum_{j=0}^{q}\alpha_{43,ij}\Delta LRATE_{i,t-j} \quad \textbf{(16)}$$

$$+\sum_{j=0}^{q}\alpha_{44,ij}\Delta RGDP_{i,t-j}+\sum_{j=0}^{q}\alpha_{45,ij}\Delta GRANT_{i,t-j}+\sum_{j=0}^{q}\alpha_{46,ij}\Delta CAB_{i,t-j}+\sum_{j=0}^{q}\alpha_{47,ij}\Delta INFLATION_{i,t-j}$$

$$+\beta_{4i}ECT_{i,t-1}+\varepsilon_{it}$$

$$\Delta GRANT_{it}=\mu_i+\sum_{j=1}^{p}\alpha_{51,ij}\Delta GRANT_{i,t-j}+\sum_{j=0}^{q}\alpha_{52,ij}\Delta FDEF_{i,t-j}+\sum_{j=0}^{q}\alpha_{53,ij}\Delta LRATE_{i,t-j} \quad \textbf{(17)}$$

$$+\sum_{j=0}^{q}\alpha_{54,ij}\Delta GRANT_{i,t-j}+\sum_{j=0}^{q}\alpha_{55,ij}\Delta DEBT_{i,t-j}+\sum_{j=0}^{q}\alpha_{56,ij}\Delta CAB_{i,t-j}+\sum_{j=0}^{q}\alpha_{57,ij}\Delta INFLATION_{i,t-j}$$

$$+\beta_{5i}ECT_{i,t-1}+\varepsilon_{it}$$

$$\Delta CAB_{it}=\mu_i+\sum_{j=1}^{p}\alpha_{61,ij}\Delta CAB_{i,t-j}+\sum_{j=0}^{q}\alpha_{62,ij}\Delta FDEF_{i,t-j}+\sum_{j=0}^{q}\alpha_{63,ij}\Delta LRATE_{i,t-j} \quad \textbf{(18)}$$

$$+\sum_{j=0}^{q}\alpha_{64,ij}\Delta RGDP_{i,t-j}+\sum_{j=0}^{q}\alpha_{65,ij}\Delta DEBT_{i,t-j}+\sum_{j=0}^{q}\alpha_{66,ij}\Delta GRANT_{i,t-j}+\sum_{j=0}^{q}\alpha_{67,ij}\Delta INFLATION_{i,t-j}$$

$$+\beta_{6i}ECT_{i,t-1}+\varepsilon_{it}$$

$$\Delta INFLATION_{it}=\mu_i+\sum_{j=1}^{p}\alpha_{71,ij}\Delta INFLATION_{i,t-j}+\sum_{j=0}^{q}\alpha_{72,ij}\Delta FDEF_{i,t-j}+\sum_{j=0}^{q}\alpha_{73,ij}\Delta LRATE_{i,t-j} \quad \textbf{(19)}$$

$$+\sum_{j=0}^{q}\alpha_{74,ij}\Delta RGDP_{i,t-j}+\sum_{j=0}^{q}\alpha_{75,ij}\Delta DEBT_{i,t-j}+\sum_{j=0}^{q}\alpha_{76,ij}\Delta GRANT_{i,t-j}+\sum_{j=0}^{q}\alpha_{77,ij}\Delta CAB_{i,t-j}$$

$$+\beta_{7i}ECT_{i,t-1}+\varepsilon_{it}$$

All variables are as previously defined, Δ denotes the first difference for each variable, ECT denotes the error correction term, p is the lag length of the autoregression, q is the lag of the distributed lags. Based on the error correction formulation in equations (2) – (8), we test for both short run and long run panel multivariate Granger causality between fiscal deficits and the vector of endogenous regressors included in the model. Short run Granger causality is tested by the joint Wald F test for coefficient restrictions. Long run Granger causality is tested by a t test of the β coefficients for the ECT for each panel multivariate function once a long run relationship is confirmed.

Impulse response functions

In addition to the panel error correction-based Granger causality tests, the study considers a dynamic panel auto regressive distributed lag model that is specified as shown in equation 20.

$$FDEF_{it} = A(L)FDEF_{it} + B(L)Z_{it} + \varepsilon_{it} \quad \textbf{(20)}$$

Where $FDEF$ is described as before, Z_{it} is a vector of other macroeconomic variables included in the model, and ε_{it} are disturbances that are assumed to be independently and identically distributed. $A(L)$ and $B(L)$ are the p^{th} and q^{th} order lag operators with $p \geq 1$ and with $q \geq 0$. In the benchmark model, we use $p = 1$ and $q = 1$.

The richness of our dataset provides critical advantages. Specifically, the dynamic feature of the panel auto regressive distributed lag model allows us to use impulse response functions to capture the dynamic relationships among budget deficits and selected macroeconomic variables. The impulse response function is given by expression in equation 21.

$$IRF(L) = B(L)/1 - A(L) \quad \textbf{(21)}$$

4. Results

4.1 Multivariate panel Granger causality analysis

In examining the multivariate panel Granger causality dynamics, the study followed the Engle and Granger (1987) two-step procedure. The first step involves estimating 7 long run models in levels using pooled panel regressions (see equation 12). These models are then used to generate residuals which represent the long run cointegrating vector. The second step involves using the lagged residuals generated in equation 12 above as the error correction terms in a system of equations used to test for both short run and long run multivariate Granger Causality. Long run causality is inferred when the lagged error-correction terms are negative and statistically significant. In addition, their absolute values should be less than unity, which confirms convergence to a stable long run stable relationship. Short run causality is inferred by the joint significance of each of the short run parameters included in the model.

Results in table 9 indicate that there is long run feedback causality between fiscal deficits and current account balance; fiscal deficits and real GDP growth; fiscal deficits and inflation; fiscal deficits and interest rates; fiscal deficits and grants; and fiscal deficits debt service. This is confirmed by the statistically significant error correction terms in each of the models in our system of equations. These results contribute to the literature that has examined the dynamic causal linkages between fiscal deficits and current account (Abbas *et al*., 2011); real GDP growth (Adam and Bevan, 2005; Kim *et al*. 2021); inflation (Lin and Chu, 2013); interest rates (Aisen and Hauner, 2013); grants (Mascagni and Timmis, 2017; Osei *et al*., 2005); and debt service (Maltritz and Wüste, 2015).

Table 9: Multivariate Granger causality test results

	Short run							Long run
	Δ $FDEF$	Δ CAB	Δ RGDP	Δ INFLATION	Δ $LRATE$	Δ $GRANT$	Δ DEBT	ECT_{t-1}
Δ FDEF	-	2.510	3.920**	0.390	0.840	51.920***	0.710	-0.480 ***
		(0.115)	(0.049)	(0.532)	(0.360)	(0.000)	(0.399)	[-7.80]
Δ CAB	0.000	-	0.960	0.090	0.010	0.360	1.700	-0.457***
	(0.962)		(0.329)	(0.762)	(0.927)	(0.548)	(0.194)	[-6.390]
Δ RGDP	3.230*	22.910	-	0.370	0.440	19.770***	1.570	-0.839***
	(0.074)	(0.000)		(0.542)	(0.510)	(0.000)	(0.212)	[-10.610]
Δ INFLATION	2.470	0.050	13.110***	-	5.310**	13.580***	0.2000	-0.239***
	(0.118)	(0.832	(0.000)		(0.022)	(0.000)	(0.655)	[-4.160]
Δ LRATE	0.390	0.880	0.620	0.570	-	2.460	1.980	-0.171***
	(0.532)	(0.350)	(0.433)	(0.453)		(0.118)	(0.161)	[-4.530]
Δ $GRANT$	39.870***	3.360*	19.110***	4.130**	0.030	-	9.110***	-0.154***
	(0.000)	(0.068)	(0.000)	(0.043)	(0.871)		(0.002)	[-3.020]
Δ DEBT	0.590	2.990*	5.700**	0.150	1.060	0.970	-	-0.096**
	(0.443	(0.085)	(0.018)	(0.698)	(0.305)	(0.320)		[-2.100]

Notes: (1) Short run F-statistics and long run ECT coefficients are tabulated (2) Short run p-values are shown in parentheses (3) Long run t-statistics are shown in square brackets (4) Significance levels: *** 1 percent significance level; ** 5% significance level; * 10% significance level

Short run Granger causality dynamics indicate mixed results. Results indicate that there is bi-directional short run causality between fiscal deficits and GDP growth. Further, results indicate no short run causality between fiscal deficits and inflation; no short run causality between fiscal deficits and current account; no short run causality between fiscal deficits and interest rates; two-way short run causality between fiscal deficits and grants; and no short run causality between fiscal deficits and debt service. Table 10 provides a summary of the direction of causality from the multivariate panel Granger causality tests.

Table 10: Direction of short and long run causality

No.	Null Hypothesis	Short run	Long run
1.	Current account does not Granger cause fiscal deficits	$CAB \neq DEFICIT$	$CAB \rightarrow DEFICIT$
2.	Fiscal deficits does not Granger cause current account	$DEFICIT \neq CAB$	$DEFICIT \rightarrow CAB$
3.	Real GDP growth does not Granger cause fiscal deficits	$GROWTH \rightarrow DEFICIT$	GROWTH $\rightarrow DEFICIT$
4.	Fiscal deficits does not Granger cause Real GDP growth	$DEFICIT \rightarrow GROWTH$	$DEFICIT \rightarrow GROWTH$
5.	Inflation does not Granger cause fiscal deficits	$INFLATION \neq DEFICIT$	$INFLATION \rightarrow DEFICIT$
6.	Fiscal deficits does not Granger cause Inflation	$DEFICIT \neq INFLATION$	$DEFICIT \rightarrow INFLATION$
7.	Interest rate differential does not Granger cause fiscal deficits	$LRATE \neq DEFICIT$	$LRATE \rightarrow DEFICIT$
8.	Fiscal deficits does not Granger cause interest rate differential	$DEFICIT \neq LRATE$	$DEFICIT \rightarrow LRATE$
9.	Grants does not Granger cause fiscal deficits	$GRANT \rightarrow DEFICIT$	$GRANT \rightarrow DEFICIT$
10.	Fiscal deficits does not Granger cause grants	$DEFICIT \rightarrow GRANT$	$DEFICIT \rightarrow GRANT$
11.	Debt service does not Granger cause fiscal deficits	$DEBT \neq DEFICIT$	$DEBT \rightarrow DEFICIT$
12.	Fiscal deficits does not Granger cause debt service	$DEFICIT \neq DEBT$	$DEFICIT \rightarrow DEBT$

Note: Causality relationships: → denotes causality in indicated direction; ≠ denotes absence of causality.

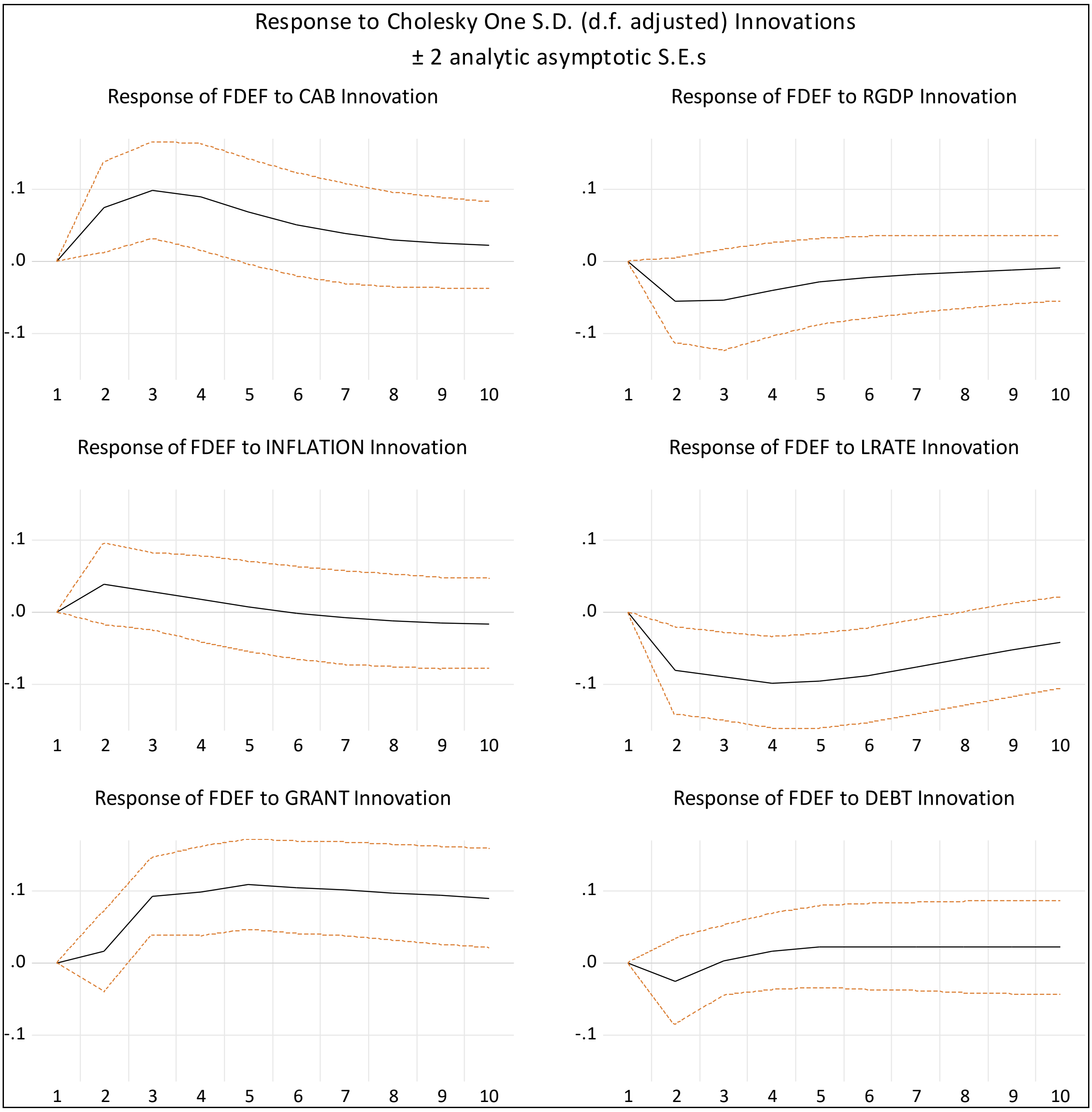
4.2 Impulse response functions

Results from the impulse response functions are qualitatively similar to those from the multivariate Granger causality analysis. The effect of the current account balance on the fiscal deficit is positive and statistically significant. A one standard deviation shock in the natural logarithm of the current account results in an increase in the fiscal balance, with this effect reaching its peak in the third period (year) before becoming insignificant after the fourth year. This finding is consistent with literature showing the positive association between fiscal deficits and current account balance (Kumhof and Laxton, 2013; Kim and Roubini, 2008).

Results further show that the effect of a positive GDP growth shock on fiscal deficits is negative, with this effect reaching its peak in the third period (year) before turning insignificant in the fourth year. The divergent relationship between these two variables indicates that fiscal policy is countercyclical. This finding is contrary to the dominant literature showing that fiscal policy tends to be pro-cyclical in developing countries (Carmignani, 2010; Kassouri and Altıntaş, 2021). However, the findings of this study are consistent with Thornton (2007) who showed that South African fiscal policy is counter-cyclical.

Results further show that the effect of a positive inflation shock is positive and statistically significant. Specifically, the effect of inflation reaches its peak in the second year and thereafter dies out and becomes insignificant by the third year. These results are consistent with Lis and Nickel (2010) who showed a statistically significant and positive relationship between inflation and budget balances.

Figure 1: Impulse response functions



A positive shock to interest rates leads to a statistically significant reduction of the fiscal deficit. This effect reaches its maximum in the fourth year but is statistically significant until the seventh year. This implies that governments run larger budget deficits in response to lower interest rate s and smaller deficits in response to higher interest rates. These results are consistent with among others, Uwilingiye and Gupta (2009) who showed similar effects using South African time series data. In addition, results show that grants have a positive and persistent effect on fiscal deficits. However, the impact of debt service on budget balances is modest and insignificant.

5. Discussion

The East African Community member states aspire to deepen economic integration, with a policy commitment to achieve convergence on key macroeconomic indicators. Regarding fiscal policy, the target is to achieve a deficit of about 3 percent of GDP. However, budget deficits have been rising over the past years raising concerns over increasing debt vulnerabilities. These fiscal vulnerabilities have been exacerbated by the ongoing COVID-19 shock and the weakened global outlook. While fiscal policy is expected to play a critical role for COVID-19 economic recovery, it will play an even more important role in dealing with country specific shocks as the countries deepen regional integration and prepare to ascend to a monetary union in the medium term. This study provided a better understanding of the dynamic linkages among fiscal deficits and key macroeconomic variables among EAC member countries.

The results of this study have significant social and practical implications. First, the dynamic relationships between fiscal policy and macroeconomic variables have social implications for welfare, equitable growth, and distribution of resources. Second, findings provide novel insights of fiscal policy determinants and causality dynamics in light of the East African Community's aspirations to achieve macroeconomic convergence targets. Finally, policy makers may find these results useful given the role fiscal policy is expected to play in supporting economic recovery in the wake of the COVID-19 crisis. Future research may consider examining the cyclicality of fiscal policy, while differentiating between the revenue and expenditure components.

6. Conclusions

This study investigated the dynamic causality linkages among fiscal deficits and selected macroeconomic indicators in East Africa. Specifically, the paper considered the effects of real GDP growth, interest rates, grants, inflation, current account balances, and debt service requirements. After deriving testable hypotheses from a simple analytical framework, the econometric analysis used two separate but complementary methodological approaches: (a) panel error correction-based Granger causality tests, and (b) panel impulse response functions.

Results confirm that there is long run feedback causality between fiscal deficits and each and every one of the explanatory variables included in the study. Short run Granger causality dynamics show that there is a two-way short run causality between fiscal deficits and GDP growth. Further, results indicate no short run causality running from fiscal deficits to inflation; no short run causality between fiscal deficits and current account; no short run causality between fiscal deficits and interest rates; two-way short run causality between fiscal deficits and grants; and no short run causality between fiscal deficits and debt service.

Impulse response function results are qualitative similar to Granger causality test results, confirming the robustness of our findings. Specifically, impulse response functions show positive and significant short run impacts of current account balance, inflation, and interest rates; negative impacts short run of real GDP growth and lending rates; and insignificant short run effects of debt service.

In order to maintain fiscal sustainability in the wake of increasing global and internal shocks, East African Community countries should implement policies to spur real GDP growth, maintain macroeconomic stability with low inflation, and maintain external sector sustainability. Further, in the context of diminished fiscal space, the authorities should prioritize growth enhancing budget-neutral reallocation of expenditures, reliance on external grants and concessional lending, and avoid inflationary financing of public deficits.

References

Abbas, S.A., Bouhga-Hagbe, J., Fatás, A., Mauro, P. and Velloso, R.C. (2011). Fiscal policy and the current account. *IMF Economic Review*, 59(4), 603-629.

Abel, A. B., & Blanchard, O. J. (1983). An intertemporal model of saving and investment. *Econometrica*, 51(3), 675-692.

Adam, C.S. and Bevan, D.L. (2005). Fiscal deficits and growth in developing countries. *Journal of Public Economics*, 89(4), 571-597.

Afonso, A. and Jalles, J.T. (2014). Causality for the government budget and economic growth. *Applied Economics Letters*, 21(17), 1198-1201

African Development Bank (2020). Coping with COVID-19 Pandemic. *East African Economic Outlook 2020*. African Development Bank Group: Abidjan

African Development Bank (2021). From Debt Resolution to Growth: The Road Ahead for Africa. *African Economic Outlook 2021.* African Development Bank Group: Abidjan

Aisen, A. and Hauner, D. (2013). Budget deficits and interest rates: a fresh perspective. *Applied Economics*, 45(17), 2501-2510.

Alberola, E., Arslan, Y., Cheng, G., and Moessner, R. (2021). Fiscal response to the COVID-19 crisis in advanced and emerging market economies. *Pacific Economic Review*, *26*(4), 459-468.

Alesina, A., and Perotti, R. (1995). The political economy of budget deficits. *IMF Economic Review*, 42(1), 1-31.

Anselin, L. 2001. Spatial Econometrics. In B. H. Baltagi (ed). *A Companion to Theoretical Econometrics*. Oxford: Blackwell Scientific Publications, 310–330.

Bai, J. and Ng, S. (2004). A PANIC attack on unit roots and cointegration. *Econometrica*, 72(4): 1127-1177.

Baltagi, B. H. (2005). *Econometric analysis of panel data*. 3rd ed. New York: Wiley.

Barro, R. J. (1989). The Ricardian approach to budget deficits. *Journal of Economic perspectives*, 3(2), 37-54.

Benmelech, E. and Tzur-Ilan, N. (2020). The determinants of fiscal and monetary policies during the COVID-19 crisis. National Bureau of Economic Research, Working Paper 27461. Cambridge

Bernheim, B. D. (1989). A neoclassical perspective on budget deficits. *Journal of Economic Perspectives*, 3(2), 55-72.

Bhat, J. A., and Sharma, N. K. (2020). Identifying fiscal inflation in India–some recent evidence from an asymmetric approach. *Journal of Economics, Finance and Administrative Science*, 25(50), 363-393.

Blanchard, O. J. (1985). Debt, deficits, and finite horizons. *Journal of political economy*, Vol 93 (2), 223-247.

Brodeur, A., Gray, D., Islam, I and Bhuiyan, S. (2021). A literature review of the economics of COVID-19, *Journal of Economic Surveys*, Vol 35(4),1007-1044.

Burger, P., and Calitz, E. (2021). Covid-19, Economic Growth and South African Fiscal Policy. *South African Journal of Economics*, 89(1), 3-24.

Bwire, T. Lloyd, T. and Morrissey, O. (2017a). Fiscal reforms and the fiscal effects of aid in Uganda. *The Journal of Development Studies*, 53(7), 1019-1036.

Bwire, T., Tamwesigire, C. and Munyankindi, P. (2017b). Fiscal Effects of Aid in Rwanda. In: Heshmati A. (eds) Studies on Economic Development and Growth in Selected African Countries. Frontiers in African Business Research. Springer, Singapore.

Carmignani, F. (2010). Cyclical fiscal policy in Africa. *Journal of Policy Modeling*, 32(2), 254-267.

Catao, L.A and Terrones, M. E. (2005). Fiscal deficits and inflation, *Journal of Monetary Economics*, 52(3), 529-554.

Cheng, B.S. (1998). The causality between budget deficit and interest rates in Japan: an application of time series analysis. *Applied Economics Letters*, 5(7), 419-422

Drummond, M.P., Aisen, M.A., Alper, M.C.E., Fuli. M.E. and Walker, M.S. (2015). Toward a monetary union in the East African Community: asymmetric shocks, exchange rates, and risk-sharing mechanisms. International Monetary Fund: Washington DC.

Dumitrescu, E.I., and Hurlin, C. (2012). Testing for Granger non-causality in heterogeneous panels. *Economic modelling*, 29(4), 1450-1460.

Eisner, R. (1989). Budget deficits: rhetoric and reality. *Journal of economic perspectives*, 3(2), 73-93.

Engle, R. F. and Granger, C. W. (1987). Co-integration and error correction: representation, estimation, and testing. *Econometrica*, Vol 55 No. 2, pp. 251 – 276.

Eslava, M. (2011). The political economy of fiscal deficits: a survey. *Journal of Economic Surveys,* 25(4), 645-673.

Fleming, M. J. (1962). Domestic Financial Policies Under Fixed and Under Floating Exchange Rates, *IMF Economic Review*, 9, 369–380

Garcia, A., and Ramajo, J. (2004). Budget deficit and interest rates: empirical evidence for Spain. *Applied Economics Letters*, 11, 715-718

Granger, C.W. (1969). Investigating causal relations by econometric models and cross-spectral methods. *Econometrica*, 37(3), 424-438

Granger, C.W. (1988). Some recent development in a concept of causality. *Journal of econometrics*, 39(1-2), 199-211.

IMF. (2018). Fiscal Monitor: Capitalizing on Good Times. International Monetary Fund: Washington, DC

IMF (2019). World Economic Outlook Database October 2019. International Monetary Fund: Washington, DC

IMF. (2020a). The Evolution of Public Debt Vulnerabilities in Lower Income Economies. Policy Paper No. 20/003. International Monetary Fund: Washington, DC

IMF (2020b). A Difficult Road to Recovery. Regional Economic Outlook: Sub-Saharan Africa. International Monetary Fund: Washington, DC

Kao, C. (1999). Spurious regression and residual-based tests for cointegration in panel data. *Journal of Econometrics*, 90(1):1-44.

Kassouri, Y. and Altıntaş, H. (2021). Cyclical drivers of fiscal policy in sub-Saharan Africa: New insights from the time-varying heterogeneity approach. *Economic Analysis and Policy*, 70, 51-67

Kim, J., Wang, M., Park, D., and Petalcorin, C. C. (2021). Fiscal policy and economic growth: some evidence from China. *Review of World Economics,* 157, 555 – 582

Kim, S. and Roubini, N. (2008). Twin deficit or twin divergence? Fiscal policy, current account, and real exchange rate in the US. *Journal of international Economics,* 74(2), 362-383.

Kose, M.A., Nagle, P., Ohnsorge, F., and Sugawara, N. (2021). Global Waves of Debt: Causes and Consequences. World Bank: Washington DC.

Kumhof, M. and Laxton, D. (2013). Fiscal deficits and current account deficits. *Journal of Economic Dynamics and Control*, 37(10), 2062-2082.

Lin, H.Y. and Chu, H.P. (2013). Are fiscal deficits inflationary? *Journal of International Money and Finance*, 32, 214-233.

Lis, E. M., and Nickel, C. (2010). The impact of extreme weather events on budget balances. *International Tax and Public Finance*, 17(4), 378-399.

Loayza, N.V and Pennings, S. (2020). Macroeconomic Policy in the Time of COVID-19: A Primer for Developing Countries. Research and Policy Briefs, No. 28, World Bank, Washington, DC.

Ltaifa, N.B., Yabara, M., and Willias, O. 2015. Economic Convergence to Support the East African Monetary Union, in Drummond *et al*. 2015. The Quest for Regional Integration in the East African Community. International Monetary Fund: Washington, DC.

Magazzino, C. (2016). Fiscal variables and growth convergence in the ECOWAS, *African Journal of Economic and Management Studies*, 7(2), 147-163.

Makin, A. J., and Layton, A. (2021). The global fiscal response to COVID-19: Risks and repercussions. *Economic Analysis and Policy*, 69, 340-349.

Mascagni, G., and Timmis, E. (2017). The fiscal effects of aid in Ethiopia: evidence from CVAR applications. *The Journal of Development Studies*, 53(7), 1037-1056.

Moreno-Dodson, B. (2012). Is Fiscal Policy the Answer? A Developing Country Perspective. The World Bank: Washington DC.

Morrissey, O. (2015). Aid and government fiscal behaviour: Assessing recent evidence. *World Development*, 69, 98-105.

Mundell, R. A. (1963). Capital Mobility and Stabilizing Policy Under Fixed and Flexible Exchange Rates, *Canadian Journal of Economics and Political Science*, 29, 475–85.

Nguyen, V.B. (2015). Effects of fiscal deficit and money M2 supply on inflation: Evidence from selected economies of Asia. *Journal of Economics, Finance and Administrative Science*, 20 (38): 49–53.

Obstfeld, M., & Rogoff, K. (1995). The intertemporal approach to the current account. *Handbook of International Economics*, 3, 1731-1799

Osei, R., Morrissey, O. and Lloyd, T. (2005). The fiscal effects of aid in Ghana". *Journal of international development*, 17(8), 1037-1053.

Papageorgiou, T., Michaelides, P.G., and Tsionas, E.G. (2016). Business cycle determinants and fiscal policy: A Panel ARDL approach for EMU. *The Journal of Economic Asymmetries*, 13, 57-68.

Pedroni, P. (1999). Critical values for cointegration tests in heterogeneous panels with multiple regressors. *Oxford Bulletin of Economics and statistics*, 61(S1): 653-670.

Pedroni, P. (2004). Panel cointegration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis. *Econometric theory,* 20(3), 597-625.

Pedroni, P. (1999). Critical values for cointegration tests in heterogeneous panels with multiple regressors. *Oxford Bulletin of Economics and Statistics*, 61(S1): 653-670.

Pedroni, P. (2004). Panel cointegration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis. *Econometric Theory*, 20(3): 597-625

Pesaran, M. H. (2007). A simple panel unit root test in the presence of cross-section dependence. *Journal of Applied Econometrics*, 22(2), 265-312.

Pesaran, M. H. (2004). General diagnostic tests for cross section dependence in panels. Cambridge Working Papers in Economics No. 0435. Cambridge: University of Cambridge.

Phillips, P. C. and Sul, D. (2003). Dynamic panel estimation and homogeneity testing under cross section dependence. *The Econometrics Journal*, 6(1): 217-259.

Phillips, P.C. and Sul, D. (2003). Dynamic panel estimation and homogeneity testing under cross section dependence. *The Econometrics Journal*, 6(1), 217-259.

Saleh, A.S., & Harvie, C. (2005). The budget deficit and economic performance: A survey. *The Singapore Economic Review*, 50(02), 211-243.

Samuelson, P. A. (1939). A Synthesis of the Principle of Acceleration and the Multiplier. *Journal of Political Economy*, 47(6), 786-797.

Seater, J. J. (1993). Ricardian equivalence. *Journal of economic literature*, 31(1): 142-190.

Sobrino, C.R. (2013). The twin deficits hypothesis and reverse causality: A short run analysis of Peru. *Journal of Economics, Finance and Administrative Science*, 18(34), 9-15.

Taylor, L., Proano, C. R., de Carvalho, L., and Barbosa, N. (2012). Fiscal deficits, economic growth and government debt in the USA. *Cambridge Journal of Economics*, 36(1),189-204.

Thornton, J. (2007). On the cyclicality of South African fiscal policy. *South African Journal of Economics*, 75(2), 258-264.

Trachanas, E. and Katrakilidis, C. (2013). The dynamic linkages of fiscal and current account deficits: new evidence from five highly indebted European countries accounting for regime shifts and asymmetries. *Economic Modelling*, 31, 502-510.

Uwilingiye, J., and Gupta, R. (2009). Temporal causality between budget deficit and interest rate: The case of South Africa. *The Indian Economic Journal*, 57(2), 79-96.

Vamvoukas, G.A. (2002). Budget Deficits and Interest Rates in a Small Open. *International Economic Journal*, 16(2), 31-36

Westerlund, J. (2007). Testing for error correction in panel data. *Oxford Bulletin of Economics and Statistics*, 69(6): 709-748.

World Bank (2019a). Global Economic Prospects: Heightened Tensions, Subdued Investment. World Bank: Washington, DC.

World Bank (2019b). World Development Indicators (WDI) Online. The World Bank Group: Washington, DC: Available at: http://datatopics.worldbank.org/world-development-indicators/

Xie, Z. and Chen, S.W. (2014). Untangling the causal relationship between government budget and current account deficits in OECD countries: Evidence from bootstrap panel Granger causality". International Review of Economics and Finance, 31, 95-104.