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THE DETERMINANTS AND CYCLICALITY OF FISCAL POLICY: EMPIRICAL EVIDENCE FROM EAST AFRICA

Joseph Mawejje[1] and Nicholas M. Odhiambo

Abstract

As part of the regional integration process, East African Community (EAC) member countries agreed upon macroeconomic convergence criteria that include, among others, harmonizing and restricting the level of fiscal deficits. However, achieving these targets has been faced with heightened vulnerabilities, including those related to the global financial crisis, the COVID-19 pandemic, and domestic policy slippages. Consequently, high fiscal deficits are fast leading to accumulation of debt. This paper investigates the macroeconomic determinants and cyclicality of fiscal policy in a panel of five EAC countries for the period 1980 - 2020. Using a combination of linear and nonlinear panel ARDL methods, long run results show that the fiscal deficit is positively associated with current account balance, real per capita GDP, and interest rate; and negatively associated with the GDP deflator, grants, and debt service. Disaggregating fiscal balances into their revenue and expenditure components shows that government spending is procyclical, while tax effort is countercyclical. Specifically, both government expenditures and tax-to-GDP ratios are positively associated with real per capita GDP regardless of whether this relationship is observed during growth accelerations or decelerations. The size and statistical significance of short run asymmetric effects of real per capita GDP on fiscal policy vary between countries.

Keywords: fiscal policy; tax revenue; government expenditure; cyclicality; East Africa

JEL: E62; E63; H61; H62

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1. Introduction

Many developing and emerging economies have experienced rising debt levels over the past decade, raising concerns over future economic growth, macroeconomic stability, and fiscal sustainability (Kassouri et al., 2021; Kose et al., 2021; Eberhardt and Presbitero, 2015). Several factors including low interest rates, a general growth slowdown, and large outlays for infrastructure spending across many countries explain these developments (World Bank, 2019). At the same time, there are concerns that recent shocks and widening fiscal deficits could lead many countries into debt traps exacerbating growth and macroeconomic vulnerabilities (IMF, 2020). Consequently, there is a re-emergence of interest among scholars on both the determinants and consequences of fiscal policy (Gui-Diby, 2021; Mawejje and Odhiambo, 2020).

Across the African region, estimates indicate that fiscal deficits doubled in 2020 amidst a growth slowdown and higher COVID-19 related policy support leading to increased debt burdens (African Development Bank, 2021a). Within the East African Community (EAC), fiscal vulnerabilities were already heightened as countries pursued more expansionary fiscal policies with a focus on debt financed public investments (Gupta and McHugh, 2015; Mawejje and Odhiambo, 2021). In Kenya, for example, the government balance exceeded 6% of GDP in each year during 2014 – 2020, while budget deficits rose from 4.8% of GDP in 2019 to 7.6% in 2020 in Uganda - significantly diverging from previous trends for both countries (IMF, 2021). Indeed, as has already been experienced elsewhere, rapid increases in the fiscal deficit may engender macroeconomic instability, arising from strong money growth, high inflation, and precipitous exchange rate depreciation (Lin and Chu, 2013; Kim and Roubini, 2008).

With a history of major economic and political crises, EAC member states have through the years undertaken various policy reforms intended to address recurring macroeconomic

imbalances. Following independence, East African countries experienced political and economic turmoil that precipitated severe macroeconomic imbalances, with rising fiscal deficits, inflation, and low growth. In Uganda and Rwanda for example, growth rates fell below zero during years of political turmoil in 1984 – 1985 and 1993 – 1994 respectively (Mawejje and Odhiambo, 2021; Ndikumana, 2001). In Tanzania, Kenya and Burundi, the international energy crises of the 1970's as well as the decline of global agricultural commodity prices constituted major terms of trade shocks (Morrisey, 1995; Swamy, 1994). Across the region, prudent fiscal policies supported under the structural adjustment programs, along with sizable debt relief operations helped to restore fiscal sustainability and growth (Gupta and McHugh, 2015). However, more recent experiences suggest a reversal of these gains, with fiscal slippages leading to accumulation of arrears and debt (Ltaifa et al., 2015; Mawejje and Odhiambo, 2021).

As part of the EAC regional integration process, member countries have agreed upon convergence criteria that include, among others, harmonizing and restricting the level of fiscal deficits (Gupta and McHugh, 2015). Specifically, member states have committed to maintain fiscal deficits below 3% of GDP, with the aim of maintaining gross public debt levels below 50 percent of GDP in net present value terms (Ltaifa et al. 2015). However, achieving fiscal convergence has been challenged by vulnerabilities that re-emerged in the aftermath of the global financial crisis (Gupta and McHugh, 2015), and more recently the COVID-19 crisis has affected growth and led to higher financing needs, exposing the region to new and greater vulnerabilities (African Development Bank, 2021a). Moreover, creating fiscal space to build resilience and restore fiscal sustainability requires a careful re-examination of the determinants and cyclical nature of fiscal policy.

The purpose of this paper is to investigate the impact of selected macro-variables on fiscal policy in a panel of five EAC countries, namely: Burundi, Kenya, Rwanda, Tanzania, and Uganda. We proceed as follows: first, the paper employs panel ARDL methods using the Pooled Mean Group (PMG) estimation procedures to empirically investigate the macroeconomic determinants of fiscal balances. Second, we introduce nonlinear real per capita GDP effects in the empirical model to make inferences about the cyclical nature of fiscal policy in East Africa. Third, we disaggregate fiscal balances into their revenue and expenditure components and examine their cyclicality with respect to real per capita GDP and relationships with selected macroeconomic variables.

This study contributes to three strands of the literature. First, the study contributes to the literature on the determinants of fiscal policy in developing countries. Second, the study contributes to the literature on fiscal policy cyclicality. Third, the study contributes to the literature on fiscal policy management in regional economic communities. To the best of the authors' knowledge this is the first study to carry out a formal empirical assessment of fiscal policy determinants and cyclicality in the East African Community. The rest of the paper is organized as follows: section two provides a brief review of the literature. Section three introduces the data and sources. Section four discusses the estimation strategy. Section five discusses the results. Section six concludes.

2. Literature Review

The theoretical literature provides four paradigms in relation to fiscal policy. From a Keynesian perspective, fiscal deficits are countercyclical and increase during growth decelerations, helping governments to stimulate national income and consumption, savings and capital formation, thus ameliorating conditions for economic growth (Bernheim, 1989; Eisner, 1989). Alternatively, governments may fail to meet tax revenue targets during periods of low growth,

resulting in budget deficits. The Ricardian equivalence theory presents fiscal deficits as acyclical (Barro 1974; Barro 1989; Seater 1993). The neoclassical view contends that fiscal deficits increase consumption, crowd out capital accumulation, and retard economic growth (Diamond, 1965; Bernheim, 1989). The fourth paradigm describes the role of political economy considerations and quality of budget institutions in shaping fiscal outcomes (Alesina and Perotti, 1995; Eslava, 2011).

Building on these theoretical expositions, a large body of literature has examined the determinants and macroeconomic effects of fiscal deficits in developing countries (Saleh and Harvie, 2005; Mawejje and Odhiambo, 2020). The first strand of the literature that we survey is related to the domestic macroeconomic environment and its implications for fiscal policy in developing countries. Within this realm, Agnello and Sousa (2009) examined the determinants of public deficit volatility in a panel of 125 countries and concluded that, among others, hyperinflation and trade openness magnify budget deficit volatility. Similar findings were documented by Lis and Nickel (2010) who showed that inflation is positively associated with budget balances.

In addition to inflation, other macroeconomic variables that have been shown to affect budget balances include interest rates. In a study on South Africa, for example, Uwilingiye and Gupta (2009) used quarterly data to show that budget balances and interest rates are cointegrated. Similarly, Tujula and Wolswijk (2007) showed that a one percent point increase in the interest rate results in a deterioration in the government budget balance ratio in the order of 0.14 percent of GDP in the next year in a sample of 22 OECD countries.

The second strand of the literature that we investigate is related to external macroeconomic conditions. Within this literature, the twin deficit hypothesis explains the often observed long run co-movement between the fiscal deficit and current account balance (Abbas et al., 2011),

while the twin divergence hypothesis posits that fiscal deficits are associated with current account improvements (Kim and Roubini, 2008). In Peru for example, Sobrino (2013) used quarterly data and Granger causality methods to show that current account balances cause fiscal deficits. Similar findings have been confirmed by, among others, Helmy (2018) for Egypt and Baharumshah et al. (2006) for the Association of Southeast Asian Nations (ASEAN) countries. However, Ahmad et al. (2015) used threshold cointegration methods on nine African countries and uncovered both positive and negative cointegrating relationships between the fiscal deficit and current account, showing that the directions of these relationships are country specific. With regard to the impact of the trade balance on fiscal deficits, Combes and Saadi-Sedik (2006) used GMM-system panel data estimation methods to show that trade openness increases a country's exposure to external shocks reinforcing the adverse effect of terms of trade instability on budget balances in developing countries.

The fiscal effects of aid have received considerable attention over the past few years. Morrisey (2015) provides a useful review of the literature highlighting the role of aid in government spending, tax revenue, and the fungibility of aid. For developing countries, aid provides the fiscal space to finance large expenditures and fiscal deficits (Brownbridge and Tumusiime-Mutebile, 2007). Consistent with this narrative, an emerging strand of literature focusing on developing countries has highlighted the existence of dynamic equilibrium relationship between aid and fiscal aggregates (Addison et al., 2017). Bwire et al (2017a) used both annual and quarterly Ugandan time series data to show that aid and fiscal variables form a stable long run cointegrated relationship. Similar findings were confirmed for Ethiopia (Mascagni and Timmis, 2017), Rwanda (Bwire et al., 2017b), and Ghana (Osei et al., 2005).

The third strand of the literature that we review concerns the cyclicality of fiscal policy in developing countries. There has been much debate on the cyclical nature of fiscal policy among

developing countries, with studies suggesting that fiscal policy tends to be procyclical in Sub Saharan Africa. In a recent study, Kassouri and Altıntaş (2021) found that fiscal policy is indeed procyclical and that trade booms tend to amplify this procyclicality. Moreover, Konuki and Villafuerte (2016) showed that fiscal procyclicality was more pronounced among commodity exporters. These findings are consistent with several studies which concluded that fiscal policy is procyclical (see for example: Talvi and Vegh, 2005; Carneiro and Garrido, 2015; Ilzetzki and Vegh, 2008; Thornton, 2008; Carmignani, 2010). However, in an earlier study on South Africa, Thornton (2007) showed that government spending tends to be countercyclical while government revenues are largely acyclical, translating into an overall countercyclical fiscal policy stance. While this study contrasts the dominant narrative of fiscal policy procyclicality in developing economies, it is consistent with a few studies that have found fiscal policy to be countercyclical, especially in more democratic countries (Diallo, 2009) and countries with strong fiscal rules and budgetary institutions (Guerguil et al. 2017).

The last strand of the literature that we review aims to establish whether the revenue and expenditure components of the fiscal deficit respond differently to changes in the business cycle. Generally, the literature shows that government spending tends to be procyclical while the evidence on revenue cyclicality is still evolving (Alesina et al., 2008; Kaminsky et al., 2004; Franknel et al. 2013; Vegh and Vuletin (2015). In a recent study, Calderón et al. (2017) found government consumption to be procyclical in Sub-Saharan African countries, with the level of cyclicality being amplified during economic booms. However, Jalles (2020) showed that government consumption tends to be less procyclical among more developed African countries and more procyclical among those that are more reliant on foreign aid inflows. With regards to tax policy, Jha et al. (2014) showed that tax cuts have a greater countercyclical impact on output than government spending in a panel of 10 developing Asian

countries. Nevertheless, Vegh and Vuletin (2015) conclude that while tax policy in developing countries is mostly procyclical, industrial countries follow acyclical tax policies.

3. Data and sources

The study uses a balanced panel dataset, constructed from annual time series data spanning 41 years during 1980 - 2020 for each of the five East African countries considered in this study. The outcome variable of interest is the fiscal deficit, expressed as a percentage of GDP. To gain more insight on fiscal policy dynamics, the study considers, separately, government revenue and expenditure data, both expressed as percentages of GDP, as outcome variables. The study considers the following control variables selected based on review of the literature and availability of data: current account balances expressed as percentages of GDP, real GDP per capita, interest rates, debt service expressed as percentages of GNI, grants expressed as percentages of GDP, and the GDP deflator.

The data used in this study are from three major sources: the IMF's World Economic Outlook (WEO), the World Bank's World Development Indicators (WDI), and the African Development Bank's COMSTAT database. Fiscal data (tax revenue, government expenditure, and fiscal balances), current account balances, and the GDP deflator were sourced from the WEO (IMF, October 2021). However, fiscal data are not available in the WEO for the entire period under study. Specifically, for Burundi data on fiscal variables is only available from 1990 onwards, for Uganda from 1997 onwards, for Tanzania from 1991 onwards, for Rwanda from 1992 onwards and for Kenya from 1982 onwards. Data gaps were filled by using fiscal data from the African Development Bank's (2021b) COMSTAT database. The rest of the data, including real GDP per capita, interest rates, public debt service, and grants data were sourced from the WDI (World Bank, 2021). Variable definitions and data sources are summarized in table 1.

Table 1: Definitions and sources of variables

Variable	Definition	Source
Fiscal deficit	The difference between revenue and expenditure, excluding interest payments, expressed as a percentage of GDP	IMF (2021); African Development Bank (2021b)
Tax revenue	Tax revenue expressed as a percentage of GDP	IMF (2021); African Development Bank (2021b)
Expenditure	General government expenditure expressed as a percentage of GDP	IMF (2021); African Development Bank (2021b)
Current account balance	The difference between a country's value of exports and imports of goods, services, and transfer payments, expressed as a percentage of GDP	IMF (2021)
GDP deflator	GDP implicit price deflator	IMF (2021)
Real per capita GDP	A country's total economic output divided by the midyear population (constant 2015 USD)	World Bank (2021)
Grants	Official bilateral and multilateral non-repayable loans received expressed as a percentage of GDP	World Bank (2021)
Debt service	Debt service of expressed as a percentage of Gross National Income (GNI) in any given year	World Bank (2021)
Interest rate	Return on government issued debt or bonds	World Bank (2021)

In the empirical realization of the model, the real per capita GDP and GDP deflator variables were transformed into their natural logarithm forms. The rest of the variables including the fiscal deficit, current account balance, interest rate, debt service, grants, tax revenue and government expenditure are not log transformed. Table 2 provides the descriptive statistics of the data used in this study. The individual time series expositions of the data are provided in appendices A1 – A5.

Table 2: Descriptive statistics

	Mean	Std dev	Min	Max	N
Fiscal balance, % GDP	-3.81	3.38	-15.46	9.47	205
Current account balance, % GDP	-5.19	4.86	-32.41	6.99	205
Real GDP per capita, (2015 constant USD)	632	308	216	1513	205
Interest rates, %	18.69	6.28	10.58	42.83	205
GDP deflator	55.62	61.52	0.02	330.43	205
Debt service, % GNI	2.64	2.49	0.22	12.99	205
Grants, % GDP	8.11	6.90	1.33	46.71	205
Tax revenue, % GDP	15.24	6.51	1.14	38.69	205
Government expenditure, % GDP	19.05	7.18	5.37	42.18	205

4. Estimation strategy and econometric model

This study uses the panel Auto Regressive Distributed Lag (ARDL) methodology, introduced by Pesaran and Smith (1995) and Pesaran, Shin, and Smith (1997) for estimating long run

relationships in dynamic heterogenous panels. Among a class of panel ARDL estimators, this study uses the Pooled Mean Group (PMG) estimator, introduced by Pesaran, Shin, and Smith (1999), which is shown to be consistent and efficient. The advantage of using this type of dynamic panel models is that they provide both the long run and short run parameter estimates. Given the objectives of the study, the empirical estimations exploit both the linear and nonlinear specifications, with the latter used to make inferences about the cyclical nature of fiscal policy.

In this study, the panel ARDL PMG estimation procedure is preferred for four reasons. First, the panel ARDL provides consistent estimates that are asymptomatically normal irrespective of whether the regressors follow $I(1)$ or $I(0)$ processes (Pesaran et al., 1999). Secondly, the panel ARDL methodology provides unbiased estimates of the long run relationship among variables. Third, the panel ARDL methodology, unlike others, uses a single reduced form equation, instead of a system of equations (Pesaran et al., 1999). Fourth, the Panel ARDL PMG approach assumes long run homogeneity where short run parameter estimates are allowed to differ by group (country in our case) while long run estimates are constrained to be the same.

A major concern in the estimation of dynamic panel data models is the introduction of bias by inclusion of a lagged dependent variable especially in short panels for which N>T (Nickell, 1981). Moreover, Pesaran and Smith (1995) showed that the traditional procedures for estimation of pooled models can produce inconsistent and potentially misleading estimates of the average values of the parameters in dynamic panel data models even in datasets with large T. The Pooled Mean Group (PMG) estimator of the ARDL method that we use, considers the Maximum Likelihood (ML) estimation of the long run coefficients and the group-specific error-correction coefficients, and is shown to provide consistent estimates of long run coefficients irrespective of whether N is large or not (Pesaran et al., 1999).

4.1 Linear Panel ARDL PMG Methodology

Following Pesaran et al. (1999), the panel $ARDL\ (p, q, q, \dots, q)$ empirical model is specified as shown in equation 1.

$$y_{it} = \sum_{j=1}^{p} \lambda_{ij} y_{i,t-j} + \sum_{j=0}^{q} \theta_{ij} x_{i,t-j} + \mu_i + \varepsilon_{it} \qquad (1)$$

In this model, y_{it} is the dependent variable for group i, λ_{ij} are scalars, and $x_{i,t-j}$ is a $kx1$ vector of explanatory variables for group i, and θ_{ij} is a $kx1$ vector of coefficients, μ_i are group fixed effects. The error terms ε_{it} are assumed to be identically and independently distributed across i and t with means 0, and variances $\sigma_i^2 > 0$, and finite fourth-order moment. They are also distributed independently of the regressors, x_{it}. The groups are indexed as $i = 1,2, \dots, N$ and time periods as as $t = 1,2, \dots, T$. In addition, the roots of the panel ARDL solution lie outside the unit circle to guarantee that the coefficient of the error correction term lies within the $(-1, 0)$ space to ensure convergence and long run model stability.

The re-parameterized panel ARDL model is specified to capture both the short run and long run dynamics as shown in equation 2.

$$\Delta y_{it} = \left(\Phi_i y_{i,t-j} + \gamma_i' x_{it} \right) + \sum_{j=1}^{p-1} \lambda_{ij}^* \Delta y_{i,t-j} + \sum_{j=0}^{q-1} \theta_{ij}^* \Delta x_{i,t-j} + \mu_i + \varepsilon_{it} \qquad (2)$$

Where $\Delta y_{it} = y_{it} - y_{i,t-1}$ is the first difference of y_{it}. The parameter Φ_i is the error correcting speed of adjustment to the long run equilibrium defined as $\Phi_i = -1\left(1 - \sum_{j=1}^{p} \lambda_{ij}\right)$. If $\Phi_i = 0$ then there is not sufficient evidence to support the conclusion that a valid long run relationship exists. This parameter is expected to be significantly negative under the prior

assumption that the variables converge to a long run stationary relationship (Blackburne and Frank 2007). γ_i is the vector which contains the long run relationships between variables.

For purpose of this study, the panel error correction representation of equation 2 above is given as shown in equation 3.

$$\Delta B_{it} = \mu_i + \sum_{j=1}^{p} \alpha_{1,ij}\Delta B_{i,t-j} + \sum_{j=0}^{q} \alpha_{2,ij}\Delta L_{i,t-j} + \sum_{j=0}^{q} \alpha_{3,ij}\Delta G_{i,t-j}$$

$$+ \sum_{j=0}^{q} \alpha_{4,ij}\Delta D_{i,t-j} + \sum_{j=0}^{q} \alpha_{5,ij}\Delta R_{i,t-j} + \sum_{j=0}^{q} \alpha_{6,ij}\Delta CA_{i,t-j} + \sum_{j=0}^{q} \alpha_{7,ij}\Delta\pi_{i,t-j} \tag{3}$$

$$\beta_{1,ij}B_{i,t-1} + \beta_{2,ij}L_{i,t-1} + \beta_{3,ij}G_{i,t-1} + \beta_{4,ij}D_{i,t-1} + \beta_{5,ij}R_{i,t-1}$$

$$+\beta_{6,ij}CA_{i,t-1} + \beta_{7,ij}\pi_{i,t-1} + \varepsilon_{it}$$

The variables in equation (3) are defined as previously, where: B_{it} represents budget balances expressed as a percentage of GDP, L_{it} is the interest rate, G_{it} is natural logarithm of real per capita GDP; D_{it} is debt service expressed as a percentage of GDP; R_{it} represents grants expressed as a percentage of GDP; CA_{it} is the current account balance expressed as a percentage of GDP; and π_{it} is the natural logarithm of the GDP deflator. The short run parameters are indexed $\alpha_{1,ij}, \dots, \alpha_{7,ij}$ while the long run parameters are denoted as $\beta_{1,ij,\dots,}\beta_{7,ij}$. Estimating the PMG panel ARDL model in equation (3) above requires that the variables have a stable long run cointegrating equilibrium.

4.2 Nonlinear Panel ARDL PMG Methodology

In addition to the panel ARDL method outlined in the previous section, this study employs the recently developed cointegrating nonlinear autoregressive distributed lag model by Shin et al. (2014). In this model, the study introduces short and long run nonlinearities by constructing positive and negative partial sum decompositions of the explanatory variables. Specifically, the

study aims to investigate the potential nonlinear effects of real per capita GDP growth on the evolution of fiscal deficits among East African countries. For purposes of the current study, the nonlinear specification of the panel ARDL model is especially useful to ascertain the cyclical nature of fiscal policy. In this respect, the study defines two variables expressed as follows:

$$G_{i,t}^+ = \sum_{j=1}^{t} \Delta G_{i,j}^+ = \sum_{j=1} max(\Delta G_{i,j}^+, 0)$$

$$G_{i,t}^- = \sum_{j=1}^{t} \Delta G_{i,j}^- = \sum_{j=1} min(\Delta G_{i,j}^-, 0)$$

Following Shin et al. (2014), the nonlinear panel error correction ARDL model is then defined as shown in equation (4).

$$\Delta B_{it} = \mu_i + \sum_{j=1}^{p} \alpha_{1,ij} \Delta B_{i,t-j} + \sum_{j=0}^{q} \alpha_{2,ij} \Delta L_{i,t-j} + \sum_{j=0}^{q} \alpha_{3,ij} \Delta G_{i,t-j}^+$$

$$+ \sum_{j=0}^{q} \alpha_{4,ij} \Delta G_{i,t-j}^- + + \sum_{j=0}^{q} \alpha_{5,ij} \Delta D_{i,t-j} + \sum_{j=0}^{q} \alpha_{7,ij} \Delta CA_{i,t-j} \qquad (4)$$

$$+ \sum_{j=0}^{q} \alpha_{8,ij} \Delta \pi_{i,t-j} + \beta_{1,ij} B_{i,t-1} + \beta_{2,ij} L_{i,t-1} + \beta_{3,ij} G_{i,t-1}^+$$

$$+ \beta_{4,ij} G_{i,t-1}^- + \beta_{5,ij} D_{i,t-1} + \beta_{6,ij} R_{i,t-1} + \beta_{7,ij} CA_{i,t-1} + \beta_{8,ij} \pi_{i,t-1}$$

$$+ \varepsilon_{it}$$

5. Empirical results

5.1 Panel Unit root tests

The study uses 3 different unit root tests to determine the order of integration of the variables. The unit root tests carried out include: (a) Levin–Lin–Chu; (b) Im-Pesaran-Shin; and (c) Fisher type Augmented Dickey-Fuller (ADF) unit root tests. The test results provided in table 3 show that all variables are integrated of the first order, I(1).

Table 3: 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)
INT_RATE	-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)	-3.513***		-0.424	-2.172**	14.933	21.723**	I (1)
TAX	-1.088	-7.785***	-0.366	-8.628***	11.034	84.916***	I (1)
EXPEND	-0.203	-9.269***	-0.904	-10.585***	18.134	105.707***	I (1)

Notes: (1) Tabulated are test statistics; (2) *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively; (3) For all unit root tests the null hypothesis is specified as follows: Ho: Panels contain unit roots; (4) All tests are carried out including individual intercept and trend

5.2 Panel cointegration tests

In this study, we use the cointegration testing procedures proposed by Pedroni (2004; 1999). The panel cointegration tests include a time trend. The null hypothesis is that the variables are not cointegrated in all panels. The test results are provided table 4 and indicate that that our panel data series are cointegrated. With these findings, we proceeded to estimate the macroeconomic determinants of fiscal policy among the five East African countries in a panel ARDL framework using the Pooled Mean Group estimation method.

Table 4: Panel cointegration tests

Panel A: Pedroni cointegration tests: Alternative hypothesis: individual AR coefs. (within-dimension)				
	Statistic	Prob	Weighted Statistic	Prob
Panel v-Statistic	-0.039	0.484	-0.943	0.827
Panel rho-Statistic	-1.577	0.057	0.281	0.611
Panel PP-Statistic	-5.601	0.000	-4.221	0.000
Panel ADF-Statistic	-3.141	0.000	-4.593	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	

5.3 Empirical Results: Panel ARDL PMG Model

The results are provided in table 5 with long run parameter estimates in panel 1 and country specific short run parameter estimates in panel 2. As shown in table 5, all individual country error correction terms have the right negative coefficients and highly statistically significant at the 1 percent level of significance. While these error correction terms show the speed of adjustment/convergence of short-term disequilibria to respective the long run paths, they confirm that a valid long run relationship exists between the fiscal deficit and independent variables, with causality running in at least one direction. This is important to confirm co-movement of these variables in the long run.

The long run model results show that all selected macroeconomic determinants of fiscal deficits enter the model with statistically significant parameter estimates. These results show that, holding other factors constant, a one percentage point increase of the current account balance is associated with a 0.212 percentage point increase in the fiscal deficit. These results are consistent with a wide range of literature that shows a positive relationship between fiscal deficits and current account balances, confirming the twin convergence hypothesis (see for example Badinger et al. 2017; Ahmad et al., 2015; Holmes 2011; Abbas et al. 2011).

Findings further show fiscal deficits are positively associated with economic performance with a one percentage point increase in real per capita GDP associated with a 7.174 percentage points improvement in the fiscal balance. These results suggest that improvements in economic performance are associated with improvements in the fiscal balance and are consistent with Tujula and Wolswijk (2007) who showed that real GDP growth has a positive impact on budget balancessbalances. These results are also consistent with Woo (2003) who uncovered similar effects in a panel of developed and developing countries.

Table 5: Panel ARDL PMG Model Estimates

Panel 1: Long run Coefficients. Dependent Variable: Fiscal Deficits (% GDP)				
Regressor	PMG	Std error	Z-statistic	P-value
Current Account Balance	0.212	0.059	3.57	0.000
$Log\ (Real\ PC\ GDP)$	7.174	1.685	4.26	0.000
$Log\ (GDP\ deflator)$	-2.062	0.316	-8.21	0.000
Interest rate	0.130	0.051	2.53	0.011
Grants	-0.073	0.038	-1.90	0.057
Debt service	-1.238	0.218	-5.68	0.000

Panel 2: Short run Coefficients. Dependent Variable: Change in Fiscal Deficits (% GDP)				
	Uganda	Kenya	Tanzania	Rwanda	Burundi
ECT_{t-1}	-0.327***	-0.151***	-0.948***	-0.383***	-0.355***
	[0.104]	[0.042]	[0.158]	[0.102]	[0.117]
$Current\ account\ balance_t$	-0.177	-0.117*	0.136 *	0.275**	-0.100
	[0.201]	[0.065]	[0.082]	[0.125]	[0.127]
$\Delta\ Log(Real\ PC\ GDP)_t$	10.114]	-7.089	-3.773	-9.401***	-35.998*
	[11.411]	[5.066]	[9.826]	[3.379]	[20.026]
$\Delta\ \log\ (GDP\ deflator)_t$	0.417	0.029	-4.988	-0.237	0.568
	[1.173]	[3.040]	[3.514]	[3.701]	[12.094]
$\Delta\ Interest\ rate\ _t$	-0.231*	0.0474	0.175***	-0.254*	-0.992
	[0.128]	[0.046]	[0.060]	[0.134]	[0.791]
$\Delta\ Grants_t$	0.051	-0.100	0.076***	-0.054	0.010
	[0.130]	[0.075]	[0.027]	[0.181]	[0.106]
$\Delta\ Debt\ service\ _t$	-0.198	0.110	0.737*	-1.186	0.648
	[0.346]	[0.117]	[0.434]	[0.828]	[0.494]
Constant	-13.292***	-4.910**	-33.347***	-12.408***	-9.288**
	[4.535]	[2.239]	[12.764]	[4.397]	[4.560]

Notes: (1) Coefficients are tabulated; standard errors are in parentheses; (2) Significance levels:
*** 1 percent significance level; ** 5% significance level; * 10% significance level

Turning to the effect of inflation (as measured by the GDP deflator) on fiscal deficits, results reveal that a one percentage point increase in the GDP deflator is associated with a 2.062 percentage point deterioration of the fiscal deficit as a percentage of GDP. This result implies that fiscal deficits tend to rise with inflation to a significant degree. This finding is consistent with a large of strand of literature that controlled for inflation in empirical models of fiscal deficits. Woo (2003) showed that fiscal deficits deteriorate with inflation with this effect particularly strong among developing countries. Agnello and Sousa (2009) showed that hyperinflation magnifies budget deficit volatility with stronger effects manifesting in small countries. These results are also consistent with findings by Lis and Nickel (2010) who showed that inflation is positively related to budget balances.

Results show that the interest rate, our measure of the cost of borrowing, is statistically significant and positively related to budget balances. Specifically, results show that a one percentage point increase in the interest rate is associated with a 0.130 percentage point improvement in the fiscal deficit as a percentage of GDP. This result suggests that governments run smaller (larger) fiscal deficits when the cost of borrowing is high (low) and is consistent with the view that governments take advantage of low interest rates expand debt finance public investments (IMF, 2020; Rogoff, 2020). In addition, results show that fiscal deficits are negatively associated with grants. Specifically, a one percentage increase in grants as a percentage of GDP is associated with a 0.073 deterioration of the fiscal deficits as a percentage of GDP. This finding is consistent with findings from earlier work that examined the dynamic equilibrium relationships between aid and fiscal policy variables (see McGillivray and Morrissey, 2004; Morrissey, 2015 for useful reviews). These findings are also consistent with Brownbridge and Tumusiime-Mutebile (2007) who showed that aid is associated with expansive fiscal policy in Uganda.

Finally, the long run PMG results show that fiscal deficits are negatively associated with debt service. Specifically, a one percentage point increase in debt service is associated with a 1.238 deterioration in the fiscal balance. Our findings are inconsistent with a section of existing empirical studies which show that higher debt is associated with improving budget balances. For instance, Maltritz and Wüste (2015) researched 27 European Union countries and showed that higher debt improves rather than worsens the budget balance and reduces deficits. In addition, Tujula and Wolswijk (2007) showed that changes in budget balances of 22 OECD countries are affected by debt growth, among many other variables.

The short run determinants of fiscal deficits are mixed and inconclusive. Specifically, the current account balance has a negative short run association with fiscal balances in Kenya, but

this effect is positive in Tanzania and Rwanda. At the same time results show that real GDP per capita is negatively associated with fiscal deficits in the short run, with this result confirmed as significant for Rwanda and Burundi, but insignificant for Uganda, Kenya, and Tanzania. However, the effect of interest rates is positive for Tanzania, but negative for Uganda and Rwanda. Moreover, results indicate that the effect of grants on fiscal deficits is positive and statistically significant in Tanzania. Finally, debt service has a positive and significant short run association with budget deficits in Tanzania, while its effect in other countries is insignificant.

5.4 Nonlinear Panel ARDL PMG Model

Results in table 6 show that the main results are unchanged: in the long run model, fiscal deficits are positively associated with current account balance, real GDP per capita (both during growth accelerations and decelerations), and interest rates; and negatively associated with the GDP deflator, grants and debt service. However, as we will see in the next section, the behavior of the fiscal deficit over the business cycle may mask differences between the behavior of the different components (revenue and expenditure) over the business cycle, which may determine the overall change in fiscal deficits. For instance, faced with limited access to external financing due to imperfections in international credit markets, a country may make significant spending cuts during a downturn to keep the fiscal deficit largely unchanged (Franknel et al., 2013).

Results in table 6 show that the individual country error correction terms have the right negative coefficients and are all highly statistically significant at convention levels. These results are also consistent with the linear panel ARDL results discussed in table 5. As discussed earlier, these results confirm co-movement of these variables in the long run.

Table 6: Nonlinear Panel ARDL PMG Model Estimates

Panel 1 – Long run Coefficients. Dependent Variable: Fiscal Deficits (% GDP)				
Regressor	PMG	Std error	Z-statistic	P-value
Current Account Balance	0.176	0.055	3.16	0.002
$Log\,(Real\,PC\,GDP)\,(+)$	7.602	1.561	4.87	0.000
$Log\,(Real\,PC\,GDP)\,(-)$	7.884	1.575	5.00	0.000
$Log\,(GDP\,deflator)$	-2.566	0.285	-8.99	0.000
Interest rate	0.145	0.049	2.95	0.003
Grants	-0.082	0.035	-2.35	0.019
Debt service	-1.281	0.216	-5.92	0.000
Panel 2 – Short run Coefficients. Dependent Variable: Change in Fiscal Deficits (% GDP)				
	Uganda	Kenya	Tanzania	Rwanda	Burundi
ECT_{t-1}	-0.401***	-0.122**	-0.998***	-0.438***	-0.312***
	[0.100]	[0.043]	[0.149]	[0.104]	[0.119]
$Current\,account\,balance_t$	-0.278	-0.114*	0.168**	0.326**	-0.064
	[0.191]	[0.067]	[0.078]	[0.141]	[0.126]
$\Delta\,Log(Real\,PC\,GDP)_t\,(+)$	23.201**	-1.601	17.870	-9.538**	-19.782
	[11.208]	[5.601]	[16.256]	[4.018]	[21.350]
$\Delta\,Log(Real\,PC\,GDP)_t\,(-)$	23.464**	-1.582	17.715	-9.662**	-19.487
	[11.241]	[5.607]	[16.234]	[4.069]	[21.440]
$\Delta\,Log(GDP\,deflator)_t$	0.394	-1.215	-2.955	-0.101	-0.980
	[1.145]	[3.200]	[3.475]	[3.561]	[11.897]
$\Delta\,Interest\,rate_t$	-0.273**	0.054	0.134**	-0.291**	-0.931
	[0.121]	[0.048]	[0.061]	[0.143]	[0.778]
$\Delta\,Grants_t$	0.069	-0.075	0.083***	-0.030	-0.003
	[0.122]	[0.077]	[0.026]	[0.176]	[0.104]
$\Delta\,Debt\,service_t$	-0.067	0.063	0.855**	-1.293	0.825*
	[0.328]	[0.120]	[0.424]	[0.825]	[0.495]
Constant	-16.074**	-4.354***	-8.933***	-15.623***	-8.953*
	[4.572]	[2.156]	[12.468]	[4.738]	[4.531]

Notes: (1) Coefficients are tabulated; standard errors are in parentheses; (2) Significance levels: *** 1 percent significance level; ** 5% significance level; * 10% significance level

Short run dynamics for the determinants of fiscal deficits are largely unchanged and confirm our earlier findings. Specifically, the current account balance has a negative short run association with fiscal balances in Kenya, but this effect is positive in Tanzania and Rwanda. The short run effect of real per capita GDP on fiscal deficits is positive for Uganda, negative for Rwanda, and insignificant for Kenya, Tanzania, and Burundi. This finding implies that in Rwanda, fiscal policy is procyclical in the short run, but countercyclical in Uganda and acyclical in the rest of the countries. Interest rates have mixed effects on fiscal deficits, with significant positive effects observed for Tanzania, and negative effects observed for Uganda and Rwanda. Moreover, results indicate that the effect of grants on fiscal deficits is positive

and statistically significant in Tanzania. Finally, debt service is positively associated with the fiscal deficit in Tanzania and Burundi.

5.5 Tax revenue

To gain more insights on the cyclical nature of fiscal policy, we disaggregate fiscal balances into their revenue and expenditure components and regress them, separately, on a set of macroeconomic variables. All variables are defined as before. In addition, T_{it} and E_{it} are defined as tax revenues and government expenditure respectively expressed as percentages of GDP. Results in table 7 show that tax-to-GDP ratios are countercyclical being positively associated with real GDP per capita regardless of whether this relationship is observed during growth accelerations or decelerations. In addition, tax revenues are positively associated with grants and debt service. The error correction terms are correctly specified and significant for Uganda (-0.319), Tanzania (-0.162), Rwanda (-0.616) and Burundi (-0.354), but insignificant for Kenya (-0.017).

The positive association between tax revenue and real per capita GDP is also observed in the short run, particularly in Rwanda and Burundi where the coefficients on real GDP per capita are statistically significant. Taken together, these results show support for countercyclicality of tax effort in East Africa but are inconsistent with a strand of the literature showing that tax policy is procyclical in developing countries (see for example Vegh and Vuletin 2015). However, these results should be interpreted with caution, as they may well reflect tax base variability and not tax policy changes over the business cycle (see Talvi and Vegh 2005 for a useful discussion around these issues).

Table 7: Tax revenue estimates

Panel 1 – Long run Coefficients. Dependent Variable: Tax Revenue (% GDP)				
Regressor	PMG	Std error	Z-statistic	P-value
Current Account Balance	0.145	0.120	1.21	0.227
$Log\ (Real\ PC\ GDP)\ (+)$	4.873	1.571	3.10	0.002
$Log\ (Real\ PC\ GDP)\ (-)$	5.286	1.598	3.31	0.001
$Log\ (GDP\ deflator)$	0.081	0.423	0.19	0.848
Interest rate	-0.013	0.081	-0.17	0.863
Grants	0.579	0.089	6.45	0.000
Debt service	0.968	0.332	2.92	0.004

Panel 2 – Short run Coefficients. Dependent Variable: Change in Tax Revenue (% GDP)					
	Uganda	Kenya	Tanzania	Rwanda	Burundi
ECT_{t-1}	-0.319***	-0.017	-0.162***	-0.616***	-0.354***
	[0.088]	[0.025]	[0.038]	[0.137]	[0.090]
$Current\ account\ balance_t$	-0.017	0.145**	-0.025	0.231**	0.132
	[0.143]	[0.069]	[0.049]	[0.115]	[0.091]
$\Delta\ Log(Real\ PC\ GDP)_t\ (+)$	9.532	-1.045	9.189	20.191***	37.261**
	[8.192]	[6.711]	[6.461]	[3.806]	[16.014]
$\Delta\ Log(Real\ PC\ GDP)_t\ (-)$	9.488	-1.094	9.197	20.228***	37.329**
	[8.206]	[6.721]	[6.470]	[3.835]	[16.074]
$\Delta\ Log(GDP\ deflator)_t$	-1.906*	-7.211**	-1.756	-5.113*	4.173
	[1.053]	[3.063]	[1.703]	[2.967]	[7.793]
$\Delta\ Interest\ rate_t$	-0.013	0.073	-0.089***	-0.214	-0.208
	[0.081]	[0.047]	[0.032]	[0.139]	[0.531]
$\Delta\ Grants_t$	-0.110	0.096	-0.089***	-0.072	-0.201**
	[0.091]	[0.077]	[0.016]	[0.162]	[0.081]
$\Delta\ Debt\ service_t$	-0.174	0.082	0.670***	2.006***	0.336
	[0.224]	[0.113]	[0.173]	[0.729]	[0.344]
Constant	-7.913**	0.192	-4.156**	-11.996*	-6.699*
	[3.759]	[0.753]	[1.852]	[6.914]	[3.610]

Notes: (1) Coefficients are tabulated; standard errors are in parentheses; (2) Significance levels:
*** 1 percent significance level; ** 5% significance level; * 10% significance level

5.6 Government expenditure

Considering government spending as a fiscal policy outcome of interest, we observe presence of long run equilibrium between government expenditure and selected macroeconomic variables, although the speed of adjustment varies between countries. In addition, results in table 8 show that in the long run, expenditures are highly procyclical and are positively associated with real per capita GDP during both growth accelerations and decelerations. These results confirm that there is co-movement between these two variables regardless of whether this relationship is observed during growth accelerations or decelerations. In addition,

expenditures are positively associated with the current account balance, interest rates, grants, and debt service; and negatively associated with the GDP deflator.

The error correction terms are correctly specified and significant for Uganda (-0.455), Kenya (-0.027), Rwanda (-0.770) and Burundi (-0.669), but insignificant for Tanzania (-0.049). Taken together, the results in table 8 show support for procyclicality of government expenditure in East Africa and are consistent with a large amount of the literature showing that government spending is highly procyclical in developing countries (see for example: Jalles 2020; Calderón and Nguyen, 2016; Carmignani, 2010).

Table 8: Expenditure estimates

Panel 1 – Long run Coefficients. Dependent Variable: Government Expenditure (% GDP)				
Regressor	PMG	Std error	Z-statistic	P-value
Current Account Balance	0.435	0.124	3.51	0.000
$Log\ (Real\ PC\ GDP)\ (+)$	7.788	1.690	4.61	0.000
$Log\ (Real\ PC\ GDP)\ (-)$	8.569	1.784	4.80	0.000
$Log\ (GDP\ deflator)$	-1.471	0.470	-3.12	0.002
Interest rate	0.229	0.100	2.28	0.022
Grants	0.485	0.096	5.04	0.000
Debt service	0.661	0.364	1.81	0.070

Panel 2 – Short run Coefficients. Dependent Variable: Change in Government Expenditure (% GDP)					
	Uganda	Kenya	Tanzania	Rwanda	Burundi
ECT_{t-1}	-0.455***	-0.027	-0.049	-0.770***	-0.669***
	[0.101]	[0.019]	[0.044]	[0.156]	[0.131]
$Current\ account\ balance_t$	-0.376	0.045	0.152	0.036	0.003
	[0.243]	[0.064]	[0.097]	[0.158]	[0.128]
$\Delta\ Log(Real\ PC\ GDP)_t\ (+)$	31.664**	-11.635*	-1.076	11.814**	42.637*
	[14.041]	[6.629]	[12.414]	[5.301]	[22.826]
$\Delta\ Log(Real\ PC\ GDP)_t\ (-)$	31.851**	-11.636*	-1.092	11.589**	42.891*
	[14.067]	[6.636]	[-12.442]	[5.345]	[22.877]
$\Delta\ Log(GDP\ deflator)_t$	-3.905**	-10.965**	-6.492**	-4.296	7.202
	[1.805]	[2.714]	[3.083]	[3.951]	[10.846]
$\Delta\ Interest\ rate\ _t$	-0.137	0.141***	0.144**	-0.584***	-1.399*
	[0.131]	[0.044]	[0.067]	[0.194]	[0.726]
$\Delta\ Grants_t$	-0.165	0.069	-0.031	-0.180	-0.322***
	[0.156]	[0.072]	[0.030]	[0.199]	[0.111]
$\Delta\ Debt\ service\ _t$	-0.454	0.036	-0.489	0.451	0.919*
	[0.375]	[0.103]	[0.358]	[0.921]	[0.474]
Constant	-19.017***	2.493***	-1.236	-26.019***	-19.692***
	[6.261]	[0.950]	[1.992]	[8.943]	[7.162]

Notes: (1) Coefficients are tabulated; standard errors are in parentheses; (2) Significance levels:
*** 1 percent significance level; ** 5% significance level; * 10% significance level

6. Conclusions

Recent developments including the COVID-19 shock and associated general economic slowdown have exacerbated already existing fiscal vulnerabilities among many developing countries. In the African region, fiscal deficits are estimated to have doubled in 2020, raising concerns over debt sustainability. In the East African Community, these developments are likely to delay macroeconomic convergence whose targets include, among others, harmonizing and restricting the level of fiscal deficits to 3% of GDP, potentially leading to heightened liquidity and debt risks.

This paper investigated the macroeconomic determinants and cyclicality of fiscal deficits in a panel of 5 EAC countries, finding that fiscal deficits are positively associated with current account balance, real per capita GDP growth, and interest rates; and negatively associated with the GDP deflator, grants, and debt service. Disaggregating fiscal balances into their revenue and expenditure components showed that government expenditures are procyclical and increase during growth accelerations but decrease during growth decelerations, maintaining a positive association with real per capita GDP regardless of whether this relationship is observed during growth accelerations or decelerations. However, tax effort is shown to be countercyclical with tax-to-GDP ratios positively associated with real per capita GDP regardless of whether this relationship is observed during growth accelerations or decelerations. Nevertheless, the size, direction, and significance of short run asymmetric effects of real per capita GDP growth on fiscal policy variables vary between countries.

Our findings have important implications for policy. Specifically, the authorities in the East African Community may consider introducing carefully designed fiscal rules to ensure that fiscal policy in smoothed over the business cycle. Such policies should ensure that expenditure pressures are contained during periods of economic boom, providing buffers that can be relied

upon during downturns. In addition, policy makers may consider taking proactive measures to deepen domestic financial markets, which may serve to improve access to financing during episodes of growth decelerations. Cognizant of the potential adverse effects of sudden stops that may be exacerbated through deepened financial markets, these measures should go hand in hand with actions to diversify these economies and reduce reliance on few commodity exports which tend to amplify boom-bust cycles.

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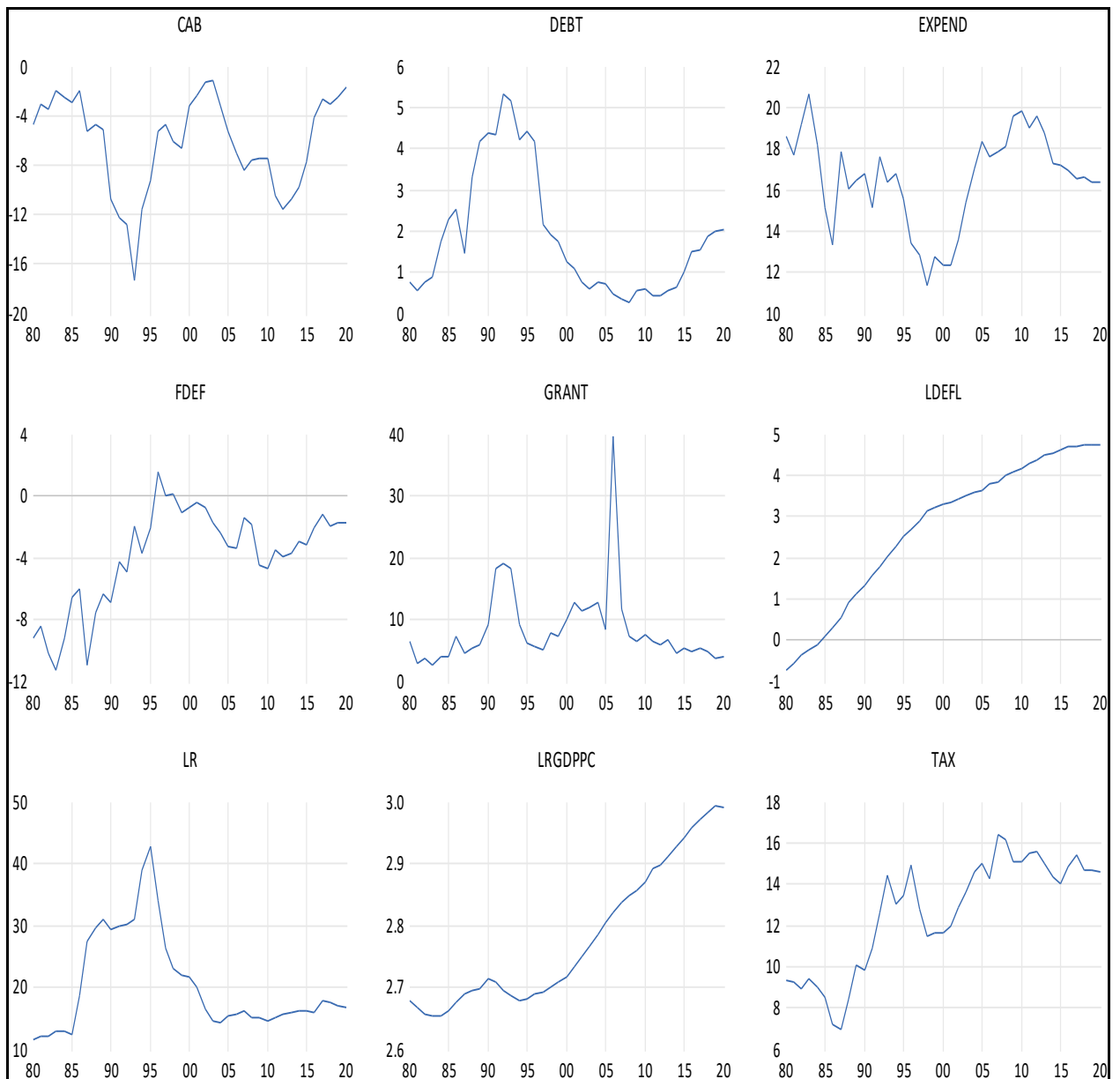
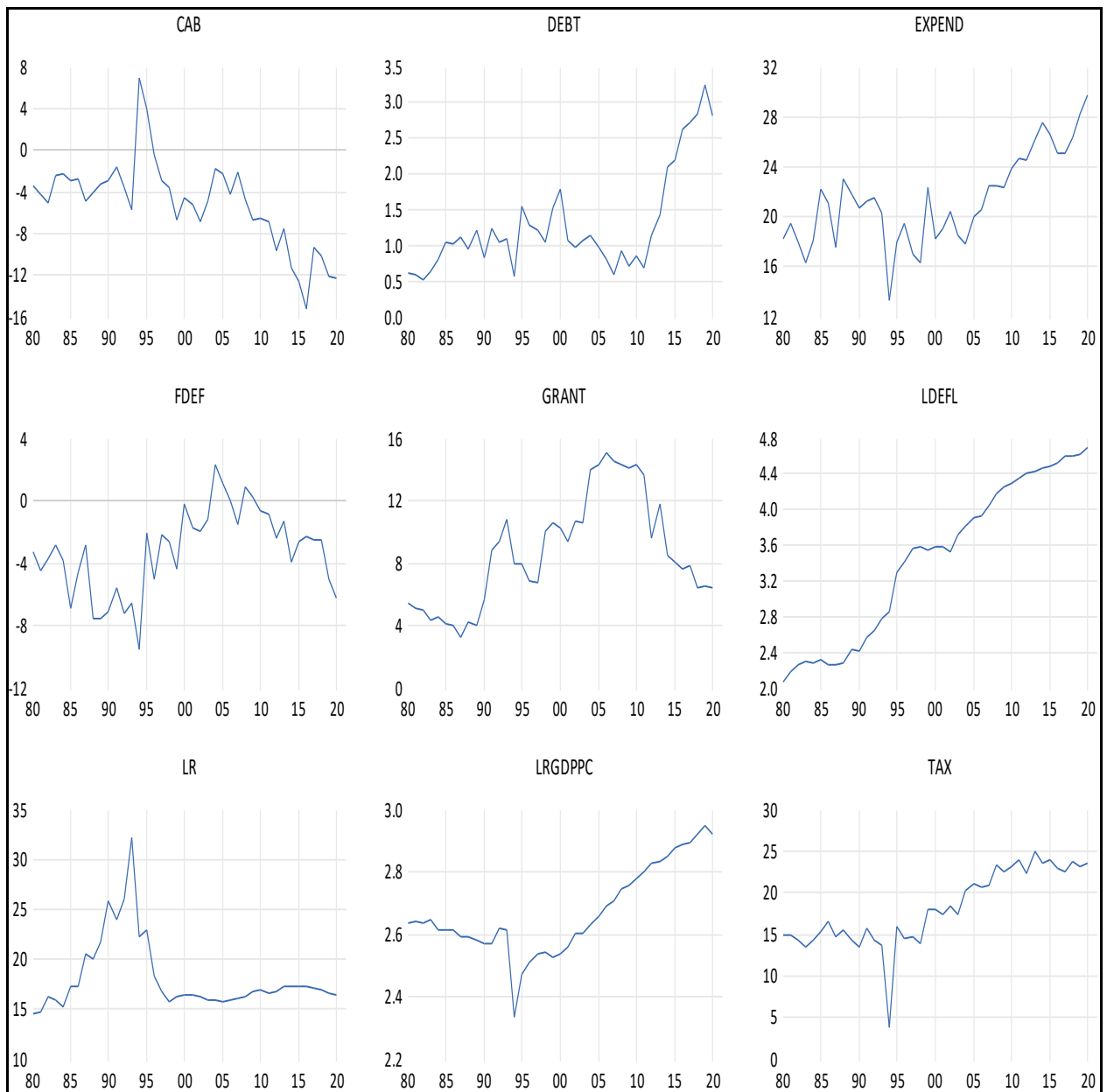Appendix A1: Graphical exposition of Uganda time series data
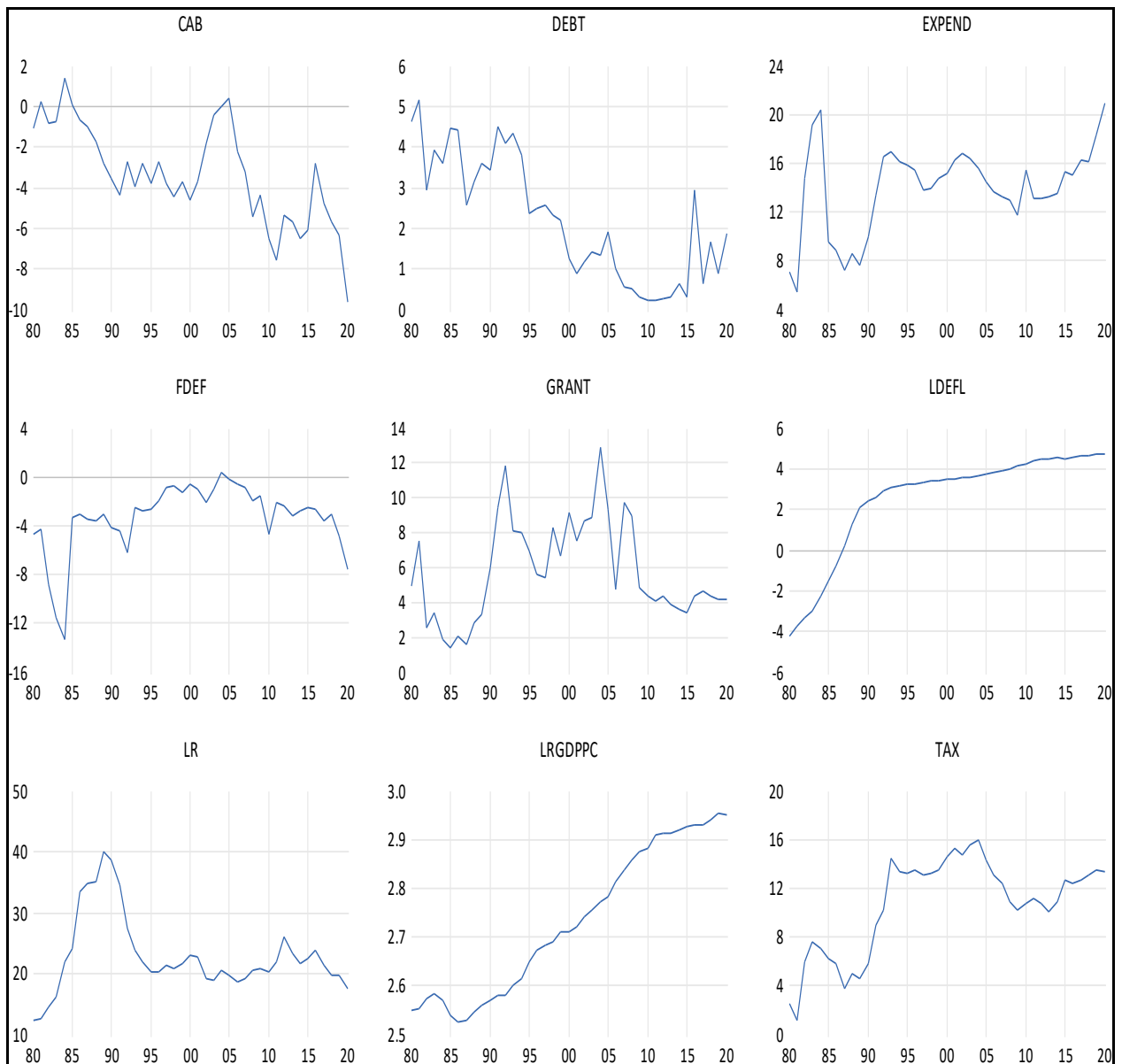
Appendix A2: Graphical exposition of Kenya time series data
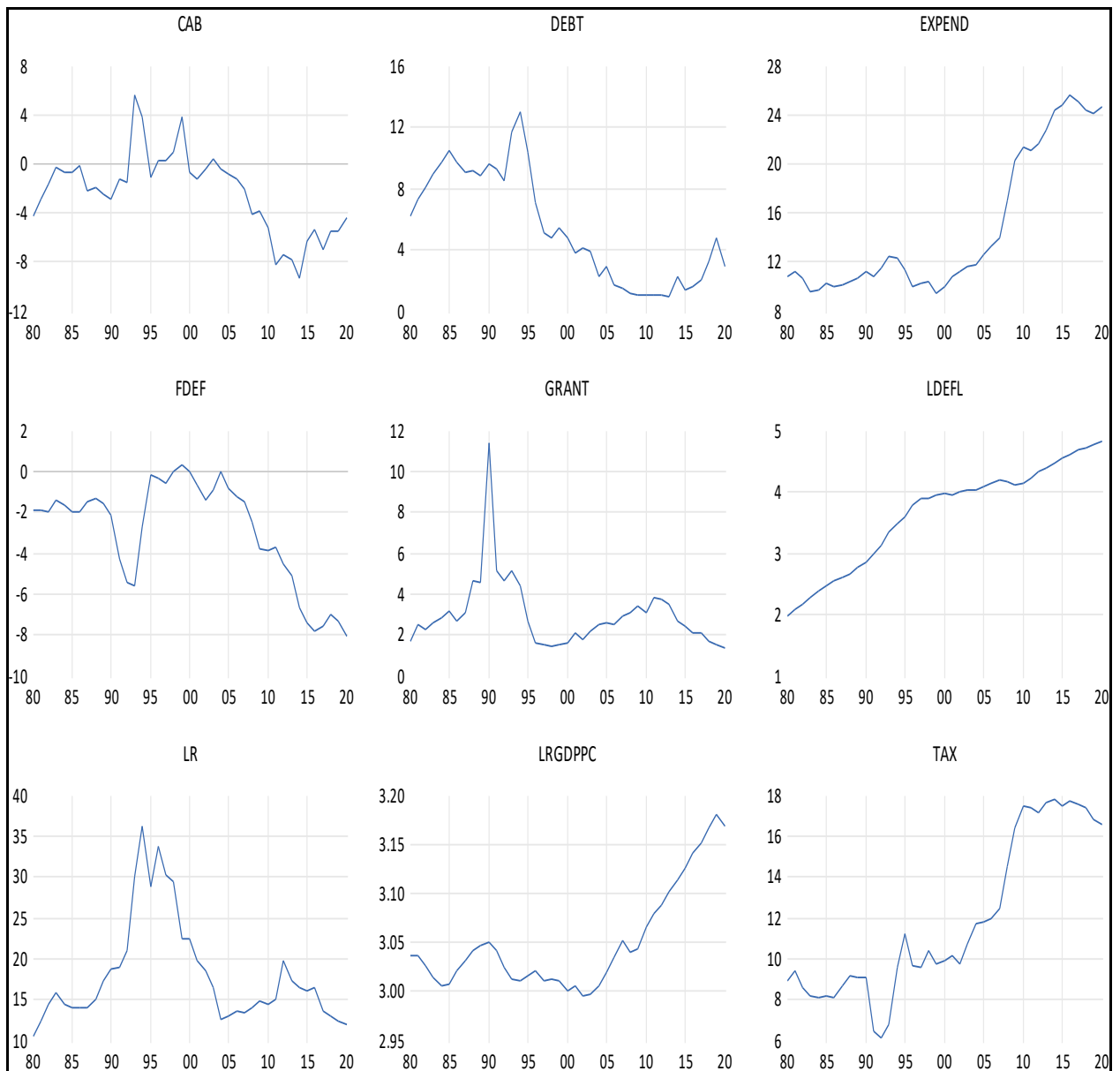
Appendix A3: Graphical exposition of Tanzania time series data

Appendix A4: Graphical exposition of Rwanda time series data

Appendix A5: Graphical exposition of Rwanda time series data