Applied Economics and Finance; Vol. 13, No. 1; 2026
ISSN 2332-7294 E-ISSN 2332-7308
Published by Redfame Publishing

Exploring the Nonlinear Relationship between Fiscal Policy and Economic Growth in Uganda: A NARDL Perspective

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Received: April 30, 2026 Revised: June 8, 2026 Accepted: June 20, 2026

Available online: June 26, 2026 URL: https://doi.org/10.11114/aef.v13i1.9005

Abstract

This study examines the asymmetric effects of fiscal policy on economic growth in Uganda using annual data from 1983 to 2020 obtained from the Uganda Revenue Authority and the World Bank. Employing the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests, the results reveal a mixture of I(0) and I(1) variables, justifying the use of the NARDL bounds testing approach to cointegration. The findings confirm a long-run cointegrating relationship among the variables and demonstrate significant asymmetric effects of fiscal policy, particularly government expenditure and tax revenue on economic growth in the long run, while short-run asymmetry is mainly observed in tax revenue, with overall fiscal responses appearing symmetric. These results imply that positive and negative fiscal shocks have differing impacts on growth over time, leading to the recommendation that fiscal policy be strategically directed toward productive investments, improved private sector support, and the creation of an enabling environment to accelerate sustainable economic growth and facilitate the attainment of middle-income status.

Keywords: Fiscal Policy, Economic Growth, Asymmetric Effects, NARDL, Uganda

1. Introduction

The relationship between fiscal policy, tax revenue, and economic growth has been a focal point of research in both developed and developing countries over the past three decades. While much of the literature has examined whether fiscal policy significantly influences growth, fewer studies have explored the nature of this relationship, particularly regarding its short- and long-run effects. Understanding these dynamics is critical, as it reveals the sensitivity of economic growth to changes in government expenditure and tax revenue. Fiscal policy, through adjustments in spending and taxation, serves as a key instrument for influencing economic activity. Expansionary fiscal policy, characterized by increased government spending or reduced taxes, stimulates the economy by directly purchasing goods and services or indirectly increasing disposable income, thereby boosting consumption. Conversely, contractionary fiscal policy, through reduced spending or higher taxes, slows economic activity, helping to manage inflation, trade deficits, or public debt.

Government expenditure has been widely associated with economic growth under both Wagner's Law and Keynesian theory. Wagner's Law posits that public sector spending rises disproportionately with income due to increasing demand for public goods and services, while Keynesian theory emphasizes proactive fiscal policy as a tool to boost aggregate demand, particularly during downturns. Empirical evidence suggests that well-targeted spending, especially on infrastructure, human capital, and social services, can stimulate growth by enhancing private-sector productivity and overall output. However, debates persist, with neoclassical perspectives questioning the long-term effectiveness of government stimulus in promoting growth, particularly in the context of financial crises.

Revenue, particularly tax revenue, represents a critical component of fiscal policy, encompassing taxes from diverse sources, social contributions, and other revenue-generating activities. While lower tax revenue may encourage private saving and investment, it can also exacerbate government deficits, constrain public investment, and impede economic growth. Taxes enable governments to fund essential commitments, including education, healthcare, pensions, unemployment benefits, and public infrastructure, thereby stimulating economic activity and supporting vulnerable populations (Abomanye-Nimenibo et al., 2018). Moreover, higher tax revenue can regulate consumption, reduce income inequalities, improve the balance of payments, and protect emerging industries, further driving sustainable growth.

In Uganda, trends in fiscal policy and tax revenue highlight the evolving role of government in shaping economic outcomes. The tax-to-GDP ratio has fluctuated significantly, peaking at 12.1% in 2019 and reaching a low of 8.2% in 2021, below the average of 16.6% reported across 30 African countries (AfDB, 2021). By 2020, general government revenue stood at 13.6% of GDP (World Bank, 2021), reflecting a gradual decline over the previous two decades. Simultaneously, Uganda's real GDP growth experienced significant shocks, including a contraction of 0.5% in 2020 following growth of 7.5% in 2019, largely due to the COVID-19 pandemic and related lockdowns. These dynamics underscore the importance of understanding the asymmetric and dynamic effects of fiscal policy and tax revenue on economic growth in order to inform effective policy design and support sustainable development.

Existing literature on the relationship between fiscal policy and economic growth presents mixed and often inconsistent findings. A likely reason for this is that these relationships may be inherently nonlinear, contrary to the assumptions of traditional endogenous growth theory; neglecting this nonlinearity can lead to misleading conclusions (Barro and Sala-i-Martin, 1995; Gilman and Kejak, 2012; Eggoh and Khan, 2014; Arawatari et al., 2018). Empirical studies in Uganda (Elmi, 2018; Matte, 2021; Nambiro-Nangobi, 2022) have predominantly assumed a linear relationship between government expenditure and economic growth, overlooking potential asymmetries. To the best of current knowledge, no study has empirically examined the nonlinear or asymmetric effects of fiscal policy on Uganda's economic growth. It is against this background that the present study investigates the asymmetric effects of government expenditure and tax revenue on economic growth, recognizing that increases and decreases in fiscal policy tools may have differing magnitudes and directions of effect.

Over time, changes in government expenditure and tax revenue as a percentage of GDP in Uganda have aimed to stimulate growth and buffer economic shocks, including those resulting from COVID-19. Despite an expansionary fiscal stance in recent years, Uganda's economic growth has slowed, with per capita GDP averaging only 1.1% annually in the five years preceding the pandemic, raising doubts about the attainment of the Vision 2040 target of US$9,500 per capita. Existing studies mostly assume a linear relationship between fiscal policy and growth, producing mixed and inconsistent evidence and often failing to account for the uncertainties and market imperfections characteristic of developing economies. These limitations suggest that the effects of fiscal policy may be nonlinear, with positive and negative changes in government spending and tax revenue having potentially asymmetric impacts. To date, no study has empirically examined these nonlinear or asymmetric effects in Uganda, and this study addresses this gap by exploring the nuanced role of fiscal policy in influencing economic performance.

Empirical research on the effects of fiscal policy on Uganda's economic growth remains limited, with studies such as Nakalinzi (2019), Obwona (2001), Musila and Belassi (2004), and Fan and Zhang (2008) providing valuable but largely linear insights. While some of these studies employed linear models, others explored nonlinear dynamics using techniques such as threshold structural vector autoregressive (SVAR) or time-varying parameter SVAR models. This study advances the literature by employing the Nonlinear Autoregressive Distributed Lag (NARDL) approach (Pesaran et al., 2001; Shin et al., 2014), which allows for the differentiation between positive and negative changes in fiscal policy instruments and captures their nonlinear effects on economic growth in both the short and long run. By explicitly considering the potential asymmetry in the effects of government expenditure and tax revenue, this research demonstrates that the impact of fiscal policy on growth is not necessarily linear, highlighting the nuanced and context-specific nature of fiscal interventions in Uganda.

2. Literature Review

2.1 Theoretical Review

The relationship between fiscal policy and economic growth is grounded in several theoretical perspectives that seek to explain how government expenditure and tax revenue influence economic performance. Fiscal policy literature generally reflects two contrasting views on the growth impact of government interventions. On one hand, government spending, particularly on human capital and infrastructure, can enhance labor productivity and stimulate private investment, thereby supporting economic growth. On the other hand, such spending may crowd out private investment, especially when financed through higher taxes or borrowing, potentially restraining growth. Neoclassical growth models, such as those of Solow (1956) and Cass (1965), posit that long-run growth is driven exogenously by technological progress, implying that fiscal shocks have only temporary effects on output (Romp and De Haan, 2007; Nurudeen and Usman, 2010).

In contrast, endogenous growth models, including those proposed by Romer (1986), Lucas (1988), Rebelo (1991), and Becker et al. (1990), argue that government spending can play a productive role by raising steady-state income per capita. In these models, fiscal policy shocks can enhance both human and physical capital accumulation or improve total factor productivity, creating a sustained positive impact on economic growth (Ghali, 1997; Romp and De Haan, 2007; Fedderke et al., 2006). Keynesian models similarly view government expenditure as a counter-cyclical tool capable of stimulating aggregate demand and output, emphasizing its potential inclusion in the aggregate production

function either directly through capital accumulation or indirectly as a driver of multifactor productivity (Duggal et al., 1999).

The theoretical debate extends to tax revenue, whose effects on growth remain inconclusive. Neoclassical growth theory suggests that taxation does not affect long-run growth, whereas endogenous growth theory posits that tax policies can have persistent impacts by shaping incentives and financing productive public investments (Romer, 1990). Empirical and theoretical literature identifies both positive and negative channels: taxes may hinder growth by altering economic choices and discouraging investment (Easterly and Rebelo, 1993), yet they can also stimulate growth indirectly through government-financed expenditures (Engen and Skinner, 1996).

Building on these frameworks, this study employs the neoclassical growth model as the foundation for examining Uganda's fiscal policy. By integrating government expenditure and tax revenue into the empirical growth model, it investigates the potential asymmetric effects of fiscal policy on economic growth, acknowledging that increases and decreases in these fiscal variables may not produce proportional impacts, particularly in the context of a developing economy characterized by market imperfections and policy uncertainties.

2.2 Empirical Review

Empirical evidence on the nature of the growth impact of fiscal policy whether linear or nonlinear remains inconclusive. Several studies have explored the relationship between government expenditure, tax revenue, and economic growth, but most have focused on linear dynamics. For instance, Wu et al. (2010) and Makhoba et al. (2019) found support for the growth-enhancing effects of government spending and revenue using panel Granger causality and Johansen VECM approaches, respectively, yet their analyses largely assumed symmetry in fiscal responses. Similarly, studies in Nigeria (Agu et al., 2015; Yusuf and Mohd, 2021) and India (Biswas and Saha, 2014) emphasized linear relationships without exploring the potential asymmetric effects of fiscal policy shocks. In the Ugandan context, Ssebulime et al. (2022) and Sennoga and Matovu (2013) similarly examined fiscal policy and growth, focusing on linear effects, leaving the question of nonlinearity unaddressed.

A smaller strand of literature has begun to explore the nonlinear and asymmetric effects of fiscal policy using advanced econometric techniques. Abdel-Latif and Mishra (2016) applied a nonlinear ARDL model to Egyptian data and found that positive and negative changes in government expenditure do not guarantee symmetric impacts on economic growth. Likewise, Asandului et al. (2021), Nuru and Gereziher (2021), Tiamiyu et al. (2021), and Yusuf and Mohd (2021) documented asymmetric responses of economic growth to fiscal policy in various developing and transition economies, demonstrating that contractionary shocks often exert stronger or more persistent effects than expansionary shocks. These studies highlight that conventional linear models may overlook critical dynamics, particularly in developing countries characterized by market imperfections, incomplete information, and embedded policy uncertainties.

Despite these insights, empirical evidence for Uganda remains sparse. The existing literature predominantly assumes symmetric effects of fiscal policy, neglecting the possibility that increases and decreases in government expenditure or tax revenue may exert divergent impacts on economic growth. This omission is particularly salient given Uganda's unique economic characteristics, including low tax-to-GDP ratios, structural fiscal constraints, and vulnerability to shocks such as COVID-19. The potential for nonlinear and asymmetric fiscal effects suggests that linear models may produce misleading conclusions, underscoring the need for more nuanced empirical investigations. Consequently, this study seeks to fill this gap by employing the Nonlinear Autoregressive Distributed Lag (NARDL) framework to examine the short-run and long-run asymmetric effects of fiscal policy measured through government expenditure and tax revenue on economic growth in Uganda. By allowing for asymmetric adjustments, the study aims to provide a more accurate and policy-relevant understanding of how fiscal policy shapes Uganda's economic trajectory.

3. Methods and Data

3.1 The Model

To empirically examine the effect of fiscal policy on economic growth, this study adopts the endogenous growth framework advanced by Becker et al. (1990), Lucas (1988), Rebelo (1991), Romer (1986), and Fedderke et al. (2006), which posits that growth is generated internally through the accumulation of human and physical capital, innovation, and knowledge spillovers. Building on the model of Casadio et al. (2012), the study investigates how fiscal policy instruments of government expenditure and tax revenue affect steady-state growth rates. Unlike traditional cointegration approaches such as Engle and Granger (1987) or Johansen and Juselius (1990), the Nonlinear Autoregressive Distributed Lag (NARDL) model offers several advantages: it accommodates variables integrated of order zero or one, is suitable for small sample sizes, and produces unbiased short- and long-run estimates even in the presence of endogenous regressors or multicollinearity (Pesaran et al., 2001; Harris and Sollis, 2003). Leveraging this framework, the study models the asymmetric effects of positive and negative fiscal shocks on economic growth, allowing for a nuanced understanding of the nonlinear dynamics between fiscal policy and economic performance in Uganda. The

empirical specification is presented below.

$$GDPP_t = \beta_0 + \beta_1 K_t + \beta_2 lnL_t + \beta_3 GOVEXP_t + \beta_4 TAXREV_t + \beta_5 INF_t + \beta_6 TO_t + \beta_7 Exdebt_t + u_t \quad \ldots\ldots\ldots \quad \ldots\ldots\ldots (1)$$

Where $GDPP, K, L, GOVEXP, TAXREV, INFL, To, Exdebt$ and u_t denote gross domestic product per capita in annual percentage growth, capital proxied by gross fixed capital formation as measured in annual percentage, labour measured by labour force participation rate as a percentage of total population, government spending measured in annual percentage, tax revenue as a percentage of GDP, inflation, trade openness as a percentage of GDP, external debt stock as a percentage of GNI, and the error term, respectively.

The study utilizes annual data from 1983 to 2020 (38 observations) to examine the asymmetric effects of fiscal policy on Uganda's economic growth. Government spending, comprising both consumption and investment, and tax revenue, expressed as percentages of GDP, serve as proxies for fiscal policy, while GDP per capita growth represents economic growth. To enhance the robustness of the analysis, the study incorporates key macroeconomic control variables identified in prior research (Thapa, 2002; Fischer, 1993), including capital formation, labor force participation, inflation, trade openness, and external debt stock. Data for all the variables, except tax revenue, were sourced from the World Bank, while tax revenue data were obtained from the Uganda Revenue Authority. Conceptually, government spending, tax revenue, labor, capital formation, and trade openness are expected to positively influence GDP per capita growth, whereas inflation and external debt are anticipated to exert negative effects, providing a comprehensive framework to assess the nonlinear dynamics of fiscal policy in Uganda.

3.2 Estimation Approach

The study begins by assessing the stationarity of all variables to prevent spurious regression results, which can arise when non-stationary variables are regressed on one another, producing misleadingly high R^2 values, significant coefficients, and low Durbin–Watson statistics (Gujarati, 2004). Stationarity is tested using both the Augmented Dickey-Fuller (ADF) and Phillips–Perron (PP) tests. Following this, the analysis applies the linear ARDL model and subsequently the nonlinear ARDL (NARDL) model to examine the asymmetric effects of fiscal policy on economic growth and to derive the cumulative dynamic multiplier effects of unit changes in government spending, tax revenue, and other key variables on growth. Finally, the Wald test is employed to formally test for the presence of nonlinear relationships, while diagnostic tests ensure that the classical regression assumptions are satisfied, providing a rigorous and robust empirical framework for the study.

The study then examines whether a linear combination of the variables forms a stationary process, indicating cointegration, which reflects long-run equilibrium relationships while allowing short-run deviations that eventually correct over time. Common methods for detecting cointegration include the Engle and Granger (1987) two-step procedure, the Johansen and Juselius (1990) maximum likelihood approach, and the ARDL bounds testing method by Pesaran et al. (2001). The Engle and Granger method estimates the model via ordinary least squares and tests the residuals for stationarity; stationary residuals indicate cointegration and allow the construction of an error correction model to capture both short- and long-run dynamics. However, this approach is limited to two variables, is prone to finite-sample bias, and can propagate errors from the first step into the second (Banerjee et al., 1986).

To address these limitations, the Johansen and Juselius method uses a maximum likelihood framework within a VAR system, allowing for multiple cointegrating relationships, but requires all variables to be integrated of the same order and is sensitive to lag selection (Greene, 2002). Given these constraints, the study adopts the NARDL bounds testing approach, which accommodates variables of mixed integration orders, small sample sizes, and endogenous regressors, making it particularly suitable for analyzing the long- and short-run asymmetric effects of fiscal policy on Uganda's economic growth.

The analysis begins by specifying the linear ARDL model, which serves as the foundation for the nonlinear extension. Originally developed by Pesaran and Shin (1995) and Pesaran (1997), and formalized by Pesaran et al. (2001), the ARDL framework is applicable when variables are integrated of order I(0) or I(1), or a combination thereof, but not I(2) (Pesaran et al., 1999; Pesaran et al., 2001). The ARDL approach is particularly advantageous because it accommodates mixed integration orders, handles small sample sizes, produces unbiased estimates even in the presence of endogenous regressors, allows for optimal lag selection, and captures both short- and long-run dynamics (Harris and Sollis, 2003). Building on this framework, the nonlinear ARDL (NARDL) model extends the analysis to account for potential asymmetries, allowing the study to examine whether positive and negative changes in government expenditure and tax revenue exert differential effects on economic growth. Cumulative dynamic multipliers are derived to trace these asymmetric effects, while Wald tests and diagnostic checks are employed to validate the robustness and reliability of the estimated relationships.

$$\Delta GDPPG_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta GDPPG_{t-1} + \sum_{i=0}^{q_1} \beta_2 \Delta K_{t-i} + \sum_{i=0}^{q_2} \beta_3 \Delta lnL_{t-i} + \sum_{i=0}^{q_3} \beta_4 \, \Delta GOVEXP_{t-i} + \sum_{i=0}^{q_4} \beta_5 \Delta TAXREV_{t-i} + \sum_{i=0}^{q_5} \beta_6 \, \Delta TO_{t-i} + \sum_{i=0}^{q} \beta_7 \Delta Exdebt_{t-i} + \sum_{i=0}^{q_6} \beta_8 \Delta INFL_{t-i} + \mu_1 GDPPG_{t-1} + \mu_2 K_{t-1} + \mu_3 L_{t-1} + \mu_4 GOVEXP_{t-1} + \mu_5 TAXREV_{t-1} + \mu_6 TO_{t-1} + \mu_7 Exdebt_{t-1} + \mu_8 INFL_{t-1} + u_t \quad (2)$$

Where Δ stands for the first difference and $\beta_1, \beta_2, \beta_3, \beta_4$, β_5, β_6 , β_7 , β_8 β_9 the short-run relationships whereas $\mu_1, \mu_2, \mu_3, \mu_4, \mu_5$, μ_6 , μ_7, μ_8, μ_9 denote the long-run relationships.

The method of modeling long-term relationships created by Pesaran et al. (2001) and expanded by Shin et al. (2013) is the Non-linear Autoregressive Distributed Lag (NARDL) model. In framing the NARDL model, considering the above linear ARDL equation (2), the variables of interest, which are government expenditure and tax revenue are decomposed into two series (positive and negative changes). To estimate the asymmetric effect of government expenditure on economic growth, based on Babatunde (2017), the study generates positive and negative changes for the fiscal policy variable of government expenditure (GOVEXP) denoted by $GOVEXP^+$ and $GOVEXP^-$ and tax revenue (TAXREV) denoted by $TAXREV^+$ and $TAXREV^-$ expressed as follows.

$$GOVEXP_t^+ = \sum_{i=1}^{t} \Delta GOVEXP_t^+ = \sum_{i=1}^{t} \max(\Delta GOVEXP_I, 0) \quad (3)$$

$$GOVEXP_t^- = \sum_{i=1}^{t} \Delta GOVEXP_t^- = \sum_{i=1}^{t} \min(\Delta GOVEXP_I, 0) \quad (4)$$

$$TAXREV_t^+ = \sum_{i=1}^{t} \Delta TAXREV_t^+ = \sum_{i=1}^{t} \max(\Delta TAXREV_I, 0) \quad (5)$$

$$TAXREV_t^- = \sum_{i=1}^{t} \Delta TAXREV_t^- = \sum_{i=1}^{t} \min(\Delta TAXREV_I, 0) \quad (6)$$

Now, Equation 2 can be rewritten in nonlinear form by incorporating a new series of positive and negative changes. The nonlinear ARDL is given below;

$$\Delta GDPPG_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta GDPPG_{t-1} + \sum_{i=0}^{q_3} \beta_2 \, \Delta GOVEXP_{t-i} + \sum_{i=0}^{q_4} \beta_3 \Delta TAXREV_{t-i} + \sum_{i=0}^{q} \beta_4 \Delta K_{t-i} + \sum_{i=0}^{q_2} \beta_5 \Delta L_{t-i} + \sum_{i=0}^{q_5} \beta_6 \, \Delta TO_{t-i} + \sum_{i=0}^{q} \beta_7 \Delta Exdebt_{t-i} + \sum_{i=0}^{q_6} \beta_8 \Delta INFL_{t-i} + \mu_1 GDPPG_{t-1} + \mu_2 GOVEXP^{(+VE)} + \mu_3 GOVEXP^{(-VE)} + \mu_4 TAXREV^{(+VE)} + \mu_5 TAXREV^{(-VE)} + \mu_6 K_{t-1} + \mu_7 L_{t-1} + \mu_8 TO_{t-1} + \mu_9 Exdebt_{t-1} + \mu_{10} INFL_{t-1} + u_t \quad (7)$$

Accordingly, this study focuses on investigating the asymmetric effects of fiscal policy on economic growth, proxied by annual GDP per capita growth. To ensure the reliability and robustness of the estimated models, a comprehensive set of diagnostic tests is conducted, including assessments for heteroscedasticity, multicollinearity, the Wald test for asymmetry, normality of residuals, serial correlation, model stability using the CUSUM test, and overall model specification. These checks provide confidence that the estimated relationships are statistically sound and accurately capture both the short and long-run dynamics of fiscal policy on economic growth.

4. Analysis of Findings

4.1 Descriptive Statistics

The descriptive statistics for the variables used in the model are presented in Table 1. These results provide an overview of the key characteristics of the data, with the mean serving as a reliable measure of central tendency, as it lies within the range defined by the minimum and maximum values for all variables. Overall, the statistics offer important preliminary insights into the distribution and variability of the data prior to the empirical analysis.

The results indicate a reasonable degree of consistency across the variables, as their mean values fall within the respective minimum and maximum ranges. Specifically, GDP per capita growth ranges from -6.471 to 8.138 with a mean of 2.354, gross capital formation from -7.95 to 40.928 with a mean value of 7.46, labour force participation from 15.418 to 16.588 with a mean of 15.997, government expenditure from 27.076 to 49.235 with a mean value of 5.938, tax revenue from 5.2 to 13 with a mean value of 9.684, inflation from 3.17 to 189.973 with a mean of 31.041, trade openness from 22.303 to 56.258 with a mean of 34.929, and external debt stock from 11.176 to 106.529 with a mean

value of 46.022. Furthermore, the relatively moderate standard deviation values suggest limited dispersion in the data, indicating the absence of significant outliers and supporting the reliability of the dataset for subsequent econometric analysis.

Table 1. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
GDPP	38	2.354	2.896	-6.471	8.138
GFCF	38	7.46	10.365	-7.95	40.928
lnLBR	38	15.997	.356	15.418	16.588
GOVEXP	38	5.938	11.227	-27.076	49.235
TAXREV	38	9.684	2.358	5.2	13
INFL	38	31.041	50.791	-3.17	189.975
Trade	38	34.929	7.112	22.303	56.258
Exdebt	38	46.022	24.565	11.176	106.529

Source: Author's computation

4.2 Pairwise Correlation Analysis

The next stage of the analysis involves examining pairwise correlations to assess the degree of linear association among the variables included in the model. This analysis also serves as a preliminary diagnostic tool for detecting potential multicollinearity among the explanatory variables. The results of the pairwise correlation analysis are presented in Table 2.

Table 2. Pairwise Correlation Results

Variables	GCF	lnLBR	GOVEXP	TAXREV	INFL	Trade	Exdebt
GCF	1.000						
lnLBR	-0.011	1.000					
GOVEXP	0.146	0.164	1.000				
TAXREV	0.074	0.673*	0.109	1.000			
INFL	0.161	-0.575*	-0.175	-0.759*	1.000		
Trade	0.077	0.686*	-0.036	0.436*	-0.475*	1.000	
Exdebt	-0.129	-0.390*	0.023	0.055	-0.136	-0.473*	1.000

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

Source: Author's computations

The pairwise correlation results indicate the absence of perfect multicollinearity among the variables, as all correlation coefficients are below the 0.8 threshold in absolute terms (Studenmund, 2001). This suggests that the regression model is unlikely to suffer from multicollinearity issues. Additionally, the results reveal varying degrees of association among the variables, with some exhibiting weak and negative correlations, while others display relatively strong and positive relationships.

Finally, the analysis proceeds with the estimation of Variance Inflation Factors (VIF) to further assess the presence of multicollinearity among the explanatory variables. The VIF results, presented in Table 3, provide a more rigorous diagnostic to confirm whether the model is free from multicollinearity concerns. The results presented in Table 3 indicate that the regression model is free from multicollinearity concerns, as the mean Variance Inflation Factor (VIF) is well below the conventional threshold of 10. This confirms that the explanatory variables are not highly correlated, ensuring the stability and reliability of the estimated coefficients.

Table 3. Variance Inflation Factor (VIF) Results

	VIF	1/VIF
Inflation Rate	7.521	0.133
Tax Revenue	5.179	0.193
Trade Openness	4.975	0.201
lnLabour Force	4.971	0.201
External Debt	3.667	0.273
L.GDP Per Capita Growth	2.206	0.453
D.Inflation Rate	2.201	0.454
D.lnLabour Force	2.125	0.471
D.External Debt	2.03	0.493
L D.lnLabour Force	1.978	0.506
Gross Investment	1.662	0.602
Government Expenditure	1.386	0.721
Mean VIF	3.325	

Source: Author's computations

Unit Root Test

This study employs the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests to examine the stationarity properties of the variables. The tests are conducted under two specifications: first with an intercept only, and then with both intercept and trend. The results of the ADF and PP unit root tests at levels are presented in Table 4.

Table 4. Unit Root Test Results in Levels

	ADF (LEVELS)		**PHILLIPS-PERRON (LEVELS)**		
Variables	Intercept	Intercept and Trend	Intercept	Intercept and Trend	Order of integration
GDPP	-3.590***	-3.202*	-3.368***	-3.388**	I(0)
	(0.0060)	(0.0840)	(0.0121)	(0.0530)	
GCF	-4.286***	-4.312***	-4.843***	-4.761***	I(0)
	(0.0005)	(0.0030)	(0.0000)	(0.0005)	
LnLBR	0.925	-1.477	0.080	-3.927**	
	(0.9934)	(0.8369)	(0.9646)	(0.0111)	
GOVEXP	-4.906***	-5.259***	-7.714***	-7.976***	I(0)
	(0.0000)	(0.0001)	(0.0000)	(0.0000)	
TAXREV	-1.559	-2.071	-1.316	-2.084	
	(0.5041)	(0.5621)	(0.6219)	(0.5552)	
INFL	-2.467	-2.746	-2.038	-2.684	
	(0.1237)	(0.2175)	(0.2700)	(0.2427)	
TO	-1.633	-1.888	-2.270	-2.571	
	(0.4660)	(0.6610)	(0.1818)	(0.2936)	
Exdebt	-2.219	-2.640	-1.761	-1.901	
	(0.1993)	(0.2620)	(0.4001)	(0.6542)	

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; Probability values in parenthesis

Source: Author's computations

The results of the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests indicate that GDP per capita growth, gross fixed capital formation, labour, and government expenditure are stationary at levels, as their probability values are below the 5% significance level. In contrast, variables such as external debt, inflation, tax revenue, and trade openness are non-stationary at levels, with probability values exceeding the 5% threshold. Consequently, these non-stationary variables are differenced once to achieve stationarity. The unit root test results after first differencing are presented in Table 5.

Table 5. Unit Root Test Results at first Difference

Augmented Dickey Fuller (ADF)			**PHILLIPS-PERRON (PP)**		
Variables	Intercept	Intercept and Trend	Intercept	Intercept and Trend	Order of Integration
LnLBR	-4.058***	-4.217***	-11.986***	-12.080***	I(1)
	(0.0011)	(0.0042)	(0.0000)	(0.0000)	
TAXREV	-3.296**	-3.246*	-6.125***	-6.035***	I(1)
	(0.0151)	(0.0755)	(0.0000)	(0.0000)	
INFL	-4.037***	-4.040***	-5.964***	-5.894***	I(1)
	(0.0012)	(0.0077)	(0.0000)	(0.0000)	
TO	-4.978***	-5.021***	-6.566***	-6.512***	I(1)
	(0.0000)	(0.0002)	(0.0000)	(0.0000)	
Exdebt	-3.353***	3.293*	-4.102***	-4.058***	I(1)
	(0.0127)	(0.0674)	(0.0010)	(0.0073)	

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; Probability values in parenthesis

Source: Author's computations

The results presented in Table 5 show that the variables previously identified as non-stationary at levels become stationary after first differencing, indicating that they are integrated of order one, I(1). Combined with those variables that are already stationary at levels, I(0), this confirms the presence of a mixed order of integration among the variables. Consequently, the use of the NARDL bounds testing approach to cointegration is appropriate, as it is well suited for models involving a combination of I(0) and I(1) variables.

4.3 Estimation of NARDL Model

4.3.1 NARDL Bounds Test Results

Since the variables in the model are a mixture of I(0) and I(1), this study employs the NARDL bounds testing approach to examine cointegration and uses the NARDL error correction model to estimate the short-run and long-run asymmetric effects of fiscal policy on economic growth in Uganda. The optimal lag length is selected using the Akaike Information Criterion (AIC), with a maximum lag of two, resulting in NARDL (2,2,2,1,2,1,0,1,0,1), as AIC performs better in small samples compared to the Schwarz Bayesian Information Criterion. The estimated results are presented in

Tables 6 and 8, with Table 6 showing the bounds test for cointegration and Table 8 reporting the short-run and long-run coefficients.

The NARDL bounds test results provide evidence of a long-run relationship among the variables, as the computed F-statistic exceeds the upper bound critical values at all significance levels. This indicates that the null hypothesis of no long-run relationship is rejected, confirming the existence of a cointegrated level relationship among the model variables.

Table 6. NARDL Bounds Test Results

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	6.886569	10%	2.16	3.24
K	9	5%	2.43	3.56
		2.5%	2.67	3.87
		1%	2.97	4.24
Actual Sample Size	35		Finite Sample: n=35	
		10%	-1	-1
		5%	-1	-1
		1%	-1	-1

Source: Author's computations

4.3.2 NARDL Estimation Results

The next step involves estimating the nonlinear relationship between economic growth, proxied by GDP per capita, and fiscal policy, measured through government expenditure and tax revenue. Prior to presenting the full NARDL results, Table 7 reports the estimates of the NARDL cointegrating equation, which capture the long-run equilibrium relationships among the variables.

Table 7. NARDL COINTEGRATING RESSULTS

Levels Equation				
Case 5: Unrestricted Constant and Unrestricted Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
GCF	1.564360	2.747044	0.569470	0.5795
LNLBR	583.7300	1259.845	0.463335	0.6514
GOVEXP_POS	-2.986605	6.180823	-0.483205	0.6376
GOVEXP_NEG	-1.717051	3.631291	-0.472848	0.6448
TAXREV_POS	-21.22971	42.21020	-0.502952	0.6241
TAXREV_NEG	-1.370155	2.951032	-0.464297	0.6507
INFL	-0.794373	1.562049	-0.508545	0.6203
TRADE	-4.585713	9.449409	-0.485291	0.6362
EXDEBT	-0.020384	0.172162	-0.118398	0.9077
EC = GDPP - (1.5644*GCF + 583.7300*LNLBR -2.9866*GOVEXP_POS				
-1.7171*GOVEXP_NEG -21.2297*TAXREV_POS -1.3702*TAXREV_NEG				
-0.7944*INFL -4.5857*TRADE -0.0204*EXDEBT)				

Source: Author's computations

The table above displays the NARDL cointegrating equations, highlighting the long-run relationships among the variables. This demonstrates that fiscal policy, through government expenditure and tax revenue, exerts a long-run asymmetric impact on economic growth in Uganda.

Table 8. NARDL Estimated Results

Dependent Variable: D(GDP Per Capita)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1218.481	390.0057	3.124265	0.0088
@TREND	0.380574	0.847235	0.449195	0.6613
LONG RUN COEFFICIENTS				
GDPP (-1)	0.137885	0.302098	0.456424	0.6562
GCF(-1)	-0.215701	0.108868	-1.981315	0.0709
LNLBR(-1)	-80.48745	25.41397	-3.167056	0.0081
GOVEXP_POS(-1)	0.411807	0.085262	4.829891	0.0004
GOVEXP_NEG(-1)	0.236755	0.058037	4.079410	0.0015
TAXREV_POS(-1)	2.927253	0.944790	3.098312	0.0092
TAXREV_NEG	0.188923	0.334203	0.565295	0.5823

INFL(-1)	0.109532	0.030001	3.650896	0.0033
TRADE	0.632300	0.132696	4.765022	0.0005
EXDEBT(-1)	0.002811	0.021014	0.133749	0.8958
ECT(-1))	-0.643577	0.188106	-3.421356	0.0051
SHORT RUN COEFFICIENTS				
D(GCF)	0.007979	0.037564	0.212416	0.8353
D(GCF(-1))	0.156082	0.050507	3.090292	0.0094
D(LNLBR)	-41.70766	18.84649	-2.213020	0.0470
D(LNLBR(-1))	60.42311	13.60962	4.439734	0.0008
D(GOVEXP_POS)	0.177780	0.051157	3.475147	0.0046
D(GOVEXP_NEG)	0.159667	0.041890	3.811587	0.0025
D(GOVEXP_NEG(-1))	-0.056466	0.030348	-1.860642	0.0875
D(TAXREV_POS)	1.337428	0.769881	1.737187	0.1079
D(INFL)	-0.004063	0.014003	-0.290131	0.7767
D(EXDEBT)	-0.133040	0.038022	-3.498985	0.0044
R-squared	0.932535	Mean dependent var		2.769007
Adjusted R-squared	0.808849	S.D. dependent var		2.378133
S.E. of regression	1.039740	Akaike info criterion		3.159663
Sum squared resid	12.97272	Schwarz criterion		4.181749
Log likelihood	-32.29410	Hannan-Quinn criter.		3.512487
F-statistic	7.539521	Durbin-Watson stat		2.274165
Prob(F-statistic)	0.000418			

Source: Author's computations

Table 8 presents the short-run and long-run asymmetric effects of fiscal policy on economic growth in Uganda between 1983 and 2020. The results highlight the nonlinear relationship between fiscal policy, captured by government expenditure and tax revenue, and economic growth, while also accounting for the influence of other control variables. Consistent with the study's objective, both positive and negative changes in government expenditure and tax revenue significantly affect economic growth in the short and long run, confirming the hypothesis of an asymmetric fiscal policy impact. Additionally, the findings show that all explanatory variables jointly influence economic growth, as evidenced by the coefficient of determination and F-statistics, indicating that tax revenue, government expenditure, gross fixed capital formation, labor force, inflation, trade openness, and external debt collectively shape Uganda's economic performance. Overall, the results in Table 8 effectively address the study's stated objective.

The error correction term (ECT) captures the speed at which the economy adjusts back to its long-run equilibrium following a shock in the explanatory variables. In this study, the ECT is correctly signed (negative) and statistically significant at the 1% level, with a magnitude between -1 and 0. The estimated coefficient of -0.6436 indicates that approximately 64.36% of any deviation from the long-run equilibrium is corrected in the short run, reflecting a relatively rapid adjustment of economic growth back to its equilibrium path.

The model's R-squared of 0.9325 indicates that about 93.25% of the variation in economic growth is explained by the independent variables included in the analysis. The adjusted R-squared of 0.8088, well above the 0.5 threshold, further confirms a strong overall fit of the model. Moreover, the F-statistic of 7.5395 with a probability value of 0.0004 leads to the rejection of the null hypothesis that all coefficients are zero, demonstrating that tax revenue, government expenditure, gross fixed capital formation, labour force, inflation rate, trade openness, and external debt stock jointly and significantly influence economic growth in Uganda.

The results in Table 8 reveal that government expenditure has a significant asymmetric effect on economic growth in Uganda, both in the long run and short run. In the long run, positive changes in government expenditure (GOVEXP_POS), lagged one period, increase economic growth with a coefficient of 0.4118, while negative changes (GOVEXP_NEG) also boost growth with a coefficient of 0.2368, both significant at the 1% level. In the short run, both positive and negative changes exhibit a positive and significant impact on growth, with coefficients of 0.1778 and 0.1597, respectively. However, negative changes lagged one period show a small but statistically significant negative effect (-0.0565) at the 10% level. These findings confirm that economic growth responds asymmetrically to fiscal policy, with positive and negative adjustments in government expenditure producing different magnitudes of impact. The asymmetric effects may reflect government efforts to stimulate employment and income through initiatives such as the Youth Livelihood Fund and Uganda Women Empowerment Program, which enhance aggregate demand and ultimately GDP per capita growth. This outcome aligns with economic theory, which posits that increased government spending stimulates economic activity (Romer, 1990), and is consistent with previous studies by Wahab (2011), Ullah et al. (2020), and Tiamiyu et al. (2021) on asymmetric fiscal effects in Anglophone countries. Figure 1 illustrates the cumulative dynamic multiplier effects of changes in government expenditure.

Figure 1 shows that economic growth in Uganda responds positively to changes in government expenditure, with both

increases and decreases in government expenditure contributing to significant growth effects in the short run and long run. This indicates that adjustments in government spending have a meaningful and sustained impact on the country's economic performance.

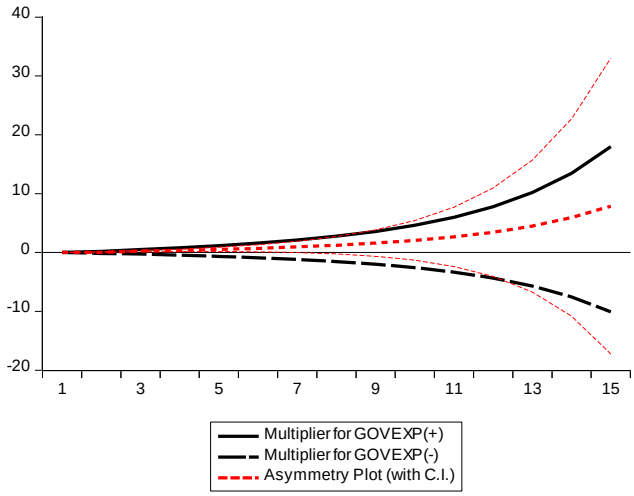


Figure 1. Cumulative Dynamic Multiplier for Changes in Government Expenditure

Source: Author's computations

The results in Table 8 further show that positive changes in tax revenue (TAXREV_POS), when lagged one period, have a positive and statistically significant asymmetric effect on economic growth at the 1% level, while negative changes (TAXREV_NEG) are statistically insignificant in the long run. The positive coefficient of 2.9273 indicates that, holding other factors constant, an increase in TAXREV_POS raises economic growth by 2.9273. In the short run, positive changes in tax revenue have a positive but insignificant effect, suggesting that economic growth responds asymmetrically to tax revenue in the long run but symmetrically in the short run. The long-run positive impact of tax revenue may arise from lower effective tax rates that increase after-tax incentives to work, save, and invest, thereby stimulating economic activity through substitution effects. Additionally, improvements in tax collection efforts by the Uganda Revenue Authority, such as widening the tax base to include social media platforms like Facebook and WhatsApp, have enhanced government revenue, contributing significantly to economic growth. These findings align with previous studies by Hussain and Malik (2016), Ullah et al. (2020), and Yusuf and Mohd (2021). Figure 2 illustrates the cumulative dynamic multiplier effects of changes in tax revenue.

Figure 2 illustrates that economic growth in Uganda responds significantly to changes in tax revenue, with both positive and negative adjustments contributing to notable increases in growth in the short run and long run. This underscores the important role of tax revenue in shaping the country's economic performance over time.

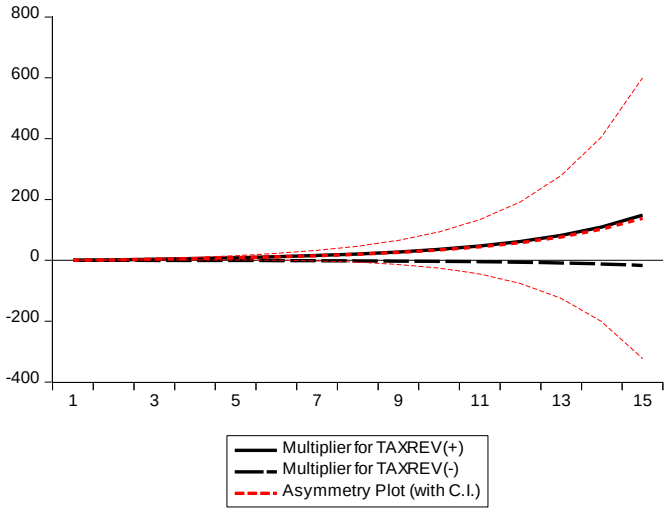


Figure 2. Cumulative Dynamic Multiplier Effect of Changes of Tax Revenue

Source: Author's computations

The results reveal mixed effects of key macroeconomic variables on Uganda's economic growth. Gross fixed capital formation, a measure of physical capital, negatively and significantly affects long-run growth (-0.2157), likely due to inefficient allocation of resources away from productive sectors like agriculture, agro-industrialization, and manufacturing. In contrast, in the short run, lagged capital formation positively influences growth (0.1561), consistent with economic theory (Solow, 1956) and prior empirical studies. The negative long-run coefficient on gross fixed capital formation is not necessarily a measurement or data issue, but is more plausibly explained by structural characteristics of the Ugandan economy. In particular, a significant share of investment may be directed toward low-productivity or non-productive uses, such as administrative infrastructure or projects with limited spillover effects to key growth-driving sectors like agriculture, agro-industrialization, and manufacturing. In addition, inefficiencies in public investment management including delays in project execution, cost overruns, weak procurement systems, and limited monitoring and evaluation can reduce the long-term productivity of capital accumulation. Uganda's structural constraints, such as a large informal sector, weak industrial base, and limited absorptive capacity for capital-intensive investments, further weaken the translation of investment into sustained output growth. Moreover, in the absence of strong technological progress and complementary factors like skilled labor and institutional quality, capital accumulation may exhibit diminishing returns in the long run, consistent with neoclassical growth theory.

Labour force participation also shows contrasting effects: it negatively impacts growth in both the long run (-0.4171) and short run (-0.8050), possibly due to high informal sector employment, but exhibits a positive effect when lagged in the short run (0.6042), reflecting temporary productivity gains. Inflation and trade openness significantly shape economic growth in the long run. Lagged inflation has a positive effect (0.1095), suggesting that effective monetary policies by the Bank of Uganda stabilize the economy and encourage activity, while short-run effects are insignificant. Trade openness promotes long-run growth (0.6323) through expanded trade opportunities within the East African regional bloc, though short-run effects are negligible. These findings align with previous studies emphasizing the long-term benefits of sound monetary policy and trade integration on economic performance.

External debt exhibits mixed impacts: it is positive but insignificant in the long run, yet negatively affects short-run growth (-0.1330), reflecting potential mismanagement of borrowed funds that are diverted from productive investments such as infrastructure. Overall, the results indicate that while fiscal and macroeconomic factors, including capital, labour, inflation, trade openness, and external debt, jointly influence economic growth, their effects differ in magnitude and direction between the short and long run, highlighting the complex dynamics of Uganda's economy.

4.4 Diagnostic Tests

The next step involves estimating the Wald test to examine the presence of an asymmetric relationship between fiscal policy and economic growth in Uganda. The results of this test are presented in Table 9.

Table 9. Wald Test Results

Test Statistic	Value	Df	Probability
F-statistic	6.513585	(2, 12)	0.0122
Chi-square	13.02717	2	0.0015

Note; Null Hypothesis: No long run Asymmetric Relationship

Source: Author's computations

The Wald test results indicate the presence of a long-run asymmetric relationship between fiscal policy and economic growth. The null hypothesis of no long-run asymmetry is rejected, as the F-statistic is significant at the 1% level, providing strong evidence that fiscal policy variables of government expenditure and tax revenue affect economic growth asymmetrically over the long term.

This study employs the Jarque-Bera test and a histogram to assess whether the model's residuals are normally distributed with a zero mean and constant variance. Figure 3 presents the histogram, illustrating that the residuals conform to the assumptions of classical linear regression.

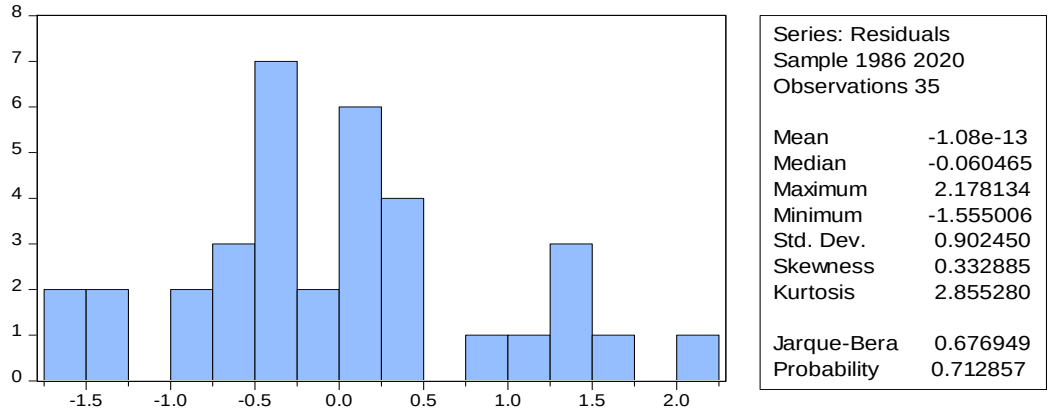


Figure 3. Histogram of Normality Test

Source: Author's computations

The Jarque-Bera normality test yields a probability of 0.7129, which is greater than the 5% significance level, leading us to fail to reject the null hypothesis that the residuals are normally distributed. Therefore, the study concludes that the residuals satisfy the normality assumption of classical linear regression, confirming that the errors follow a normal distribution.

The study applies the Breusch-Pagan LM test to detect the presence of heteroscedasticity in the NARDL model, in order to determine whether the residuals have constant variance (homoscedasticity). The results of this test are presented in Table 10.

Table 10. Breusch-Pagan-Godfrey Test for Heteroscedasticity

F-statistic	1.211772	Prob. F(18,16)	0.3524
Obs*R-squared	20.18985	Prob. Chi-Square (18)	0.3222
Scaled explained SS	3.913959	Prob. Chi-Square (18)	0.9998

Note; Null Hypothesis: Homoscedastic Variance

Source: Author's computations

The Breusch-Pagan-Godfrey test results indicate that the residuals are homoscedastic, with a probability value of 0.3222, which exceeds the 5% significance level. Consequently, we fail to reject the null hypothesis of constant variance, confirming that the model is free from heteroscedasticity.

The study assesses serial correlation in the model using the Breusch-Godfrey LM test to ensure compliance with the classical linear regression assumption of no autocorrelation. The results of this test are presented in Table 11.

Table 11. Breusch-Godfrey Serial Correlation LM Test

F-statistic	0.729894	Prob. F(2,14)	0.4994
Obs*R-squared	3.304870	Prob. Chi-Square(2)	0.1916

Note; Null Hypothesis: No Serial Correlation

Source: Author's computations

The results in Table 12 show that the model is free from serial correlation, as evidenced by the probability value of 0.4994, which exceeds the 5% significance level. This leads to a failure to reject the null hypothesis of no serial correlation, confirming that the model satisfies this classical linear regression assumption.

The Ramsey RESET test is employed to assess whether the model is correctly specified and to check for the presence of any omitted variables in the regression. The results of this test are presented in Table 12.

Table 12. Ramsey RESET Test Results

	Value	Df	Probability
F-statistic	0.898491	(4, 9)	0.5036
	Sum of Sq.	Df	Mean Squares
Test SSR	3.764297	4	0.941074
Restricted SSR	13.19085	13	1.014681
Unrestricted SSR	9.426551	9	1.047395

Note; Null Hypothesis: No omitted variables

Source: Author's computations

The Ramsey RESET test results show that the null hypothesis of no omitted variables cannot be rejected, as the p-value of 0.5036 exceeds the 5% significance level. This indicates that the model is correctly specified.

To assess whether the model's predictions remain within the 95% confidence interval, the study conducts stability tests using recursive estimates through the CUSUM and CUSUM-squared tests, shown in Figures 4 and 5. The results indicate that, for both small and large values, the test statistics remain within the 95% confidence bounds, demonstrating that the model is stable. Consequently, the model is reliable for making statistical forecasts and projections.

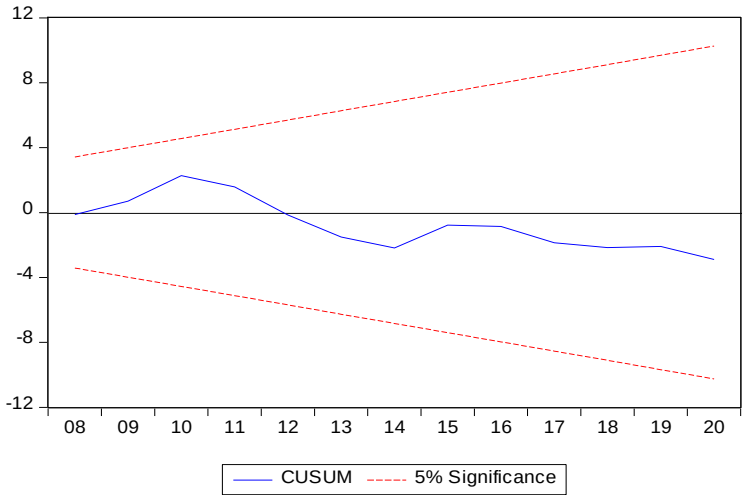


Figure 4. Recursive Estimates for the CUSUM Test

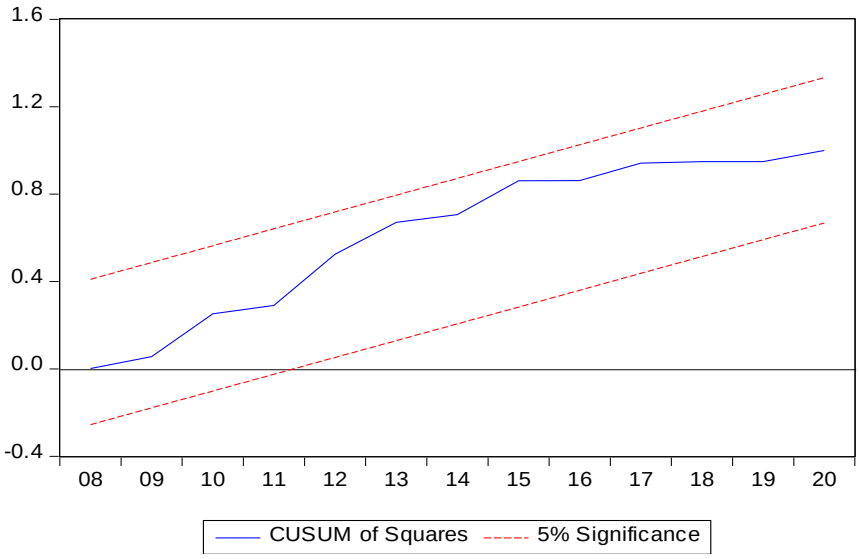


Figure 5. Recursive Estimates for the CUSUM-Squared Test

Source: Author's computations

5. Conclusion

This study empirically examines the short-run and long-run asymmetric effects of fiscal policy on economic growth in Uganda using annual data from 1983 to 2020, sourced from the World Bank's World Development Indicators and the Uganda Revenue Authority. The analysis focuses on government expenditure and tax revenue as proxies for fiscal policy, with economic growth measured by GDP per capita growth. Control variables include gross fixed capital formation (capital), labor force participation rate (labor), inflation (GDP deflator), trade openness, and external debt stock, while the empirical framework is grounded in endogenous growth theory. Stationarity tests using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) methods revealed that GDP per capita growth, gross fixed capital formation, and government expenditure are stationary at levels, whereas the other variables are stationary after first differencing. Given the mix of I(0) and I(1) variables, the study employs the NARDL bounds testing approach to examine both cointegration and asymmetric short- and long-run relationships. The bounds test confirms a long-run

cointegrating relationship, and the NARDL results show significant asymmetric effects of government expenditure and tax revenue on economic growth in both the short and long run.

Robustness checks further validate the model. The Wald test confirms the long-run asymmetric relationship between fiscal policy and economic growth, while diagnostic tests indicate that the model is free from serial correlation (Breusch-Godfrey LM test), residuals are normally distributed with zero mean and constant variance (Jarque-Bera test), and heteroscedasticity is absent (Breusch-Pagan-Godfrey test). The model is correctly specified (Ramsey RESET test) and stable over time (CUSUM and CUSUM-squared tests). Overall, these findings demonstrate that fiscal policy exerts asymmetric effects on Uganda's economic growth and that the NARDL model provides a reliable framework for analyzing both short- and long-term dynamics.

6. Policy Recommendations

Given the significant positive long-run nonlinear effect of government expenditure on economic growth, the Government of Uganda should not only increase budget allocations to productive sectors, but also institute clear expenditure prioritization and efficiency mechanisms. This includes strengthening public investment management systems to ensure rigorous project appraisal, selection, and monitoring, particularly for infrastructure projects such as road networks, electricity distribution, and water supply. Emphasis should be placed on completing ongoing flagship infrastructure projects before initiating new ones, while also reducing leakage through improved procurement oversight and digital tracking of public spending. These measures would ensure that increased expenditure translates into measurable productivity gains, employment creation, and sustained long-term growth.

Similarly, given the positive long-run asymmetric effect of tax revenue on growth, tax policy should focus on both broadening the tax base and improving compliance efficiency rather than simply increasing tax rates. The government, through the Uganda Revenue Authority, should expand formalization efforts targeting the informal sector, strengthen digital tax administration systems, and reduce compliance costs for small and medium enterprises to encourage voluntary compliance. Sector-specific taxation strategies should also be aligned with productivity objectives, ensuring that revenues collected from ICT, services, agriculture, and emerging digital platforms are reinvested into corresponding growth-enhancing sectors such as agro-industrialization, value addition, and industrial parks. This would strengthen the link between taxation and productive economic transformation.

For capital formation, rather than only encouraging higher investment levels, policy should focus on improving the quality and efficiency of investment. This includes incentivizing private sector participation through public-private partnerships (PPPs), offering targeted tax incentives for investments in manufacturing and agro-processing, and ensuring reliable access to affordable credit through development finance institutions. Strengthening infrastructure maintenance, rather than focusing solely on new capital projects, would also enhance the productivity of existing capital stock.

Regarding trade openness, policy should move beyond general openness toward strategic trade facilitation. This includes reducing non-tariff barriers at border posts, improving customs efficiency through digital clearance systems, and strengthening Uganda's participation in regional value chains within the East African Community. Export diversification should also be prioritized, particularly in high-value agricultural products and light manufacturing, supported by export financing schemes and quality certification systems to meet international standards.

Finally, for domestic revenue mobilization and external debt management, the government should adopt a fiscal consolidation framework that caps non-productive external borrowing and prioritizes concessional financing for infrastructure and human capital development. Strengthening medium-term revenue strategies, improving tax forecasting accuracy, and ring-fencing key revenues for priority sectors would reduce fiscal vulnerability and enhance sustainability.

Acknowledgments

We, the authors of this manuscript would like to express our sincere gratitude to all individuals and institutions that contributed to the successful completion of this study. We greatly appreciate the valuable insights and constructive comments provided by colleagues who assisted in reviewing and critiquing the manuscript. We are also grateful to the anonymous reviewers and the editorial team for their thorough evaluation, constructive feedback, and guidance, which significantly improved the quality of this paper. We further thank the organizations and stakeholders whose data and information supported this research. Finally, we acknowledge all those who provided administrative, technical, and manuscript preparation support throughout the study.

Author contributions

Kyewaalabye Mudasiru conceived and initiated the study idea, developed the research concept, and undertook the preliminary writing of the manuscript, including the background, literature review, and methodology sections. He was

also responsible for data collection, data analysis, interpretation of findings, and preparation of the complete manuscript draft. William Epiaka critically reviewed the manuscript, providing substantial intellectual input through proofreading, identification and correction of grammatical and typographical errors, and refinement of the overall presentation and readability of the paper. Both authors contributed to the revision of the manuscript, read and approved the final version, and agreed to be accountable for all aspects of the work.

Funding

This research received no external funding. The production of the manuscript, including all research, data collection, analysis, and publication-related activities, was solely financed by the authors. No grants, sponsorships, or financial support were received from any government agency, private organization, foundation, or other external source for the preparation and completion of this manuscript.

Competing interests

The authors declare that there are no competing interests regarding the publication of this manuscript. Specifically, the authors have no known competing financial interests, personal relationships, professional affiliations, or other circumstances that could have influenced, or appeared to influence, the research, analysis, interpretation of findings, or publication of this work.

Informed consent

Obtained.

Ethics approval

The Publication Ethics Committee of the Redfame Publishing.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

Provenance and peer review

Not commissioned; externally double-blind peer reviewed.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

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