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Growing Public Expenditure and Revenue: the Impact of Fiscal Deficits on Economic Growth of Ethiopia

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Abstract: This study aims at verifying the long run relationship between public expenditure and revenue and to assess the impact of the fiscal deficits on economic growth of Ethiopia. To this end an asymmetric cointegration test based on NARDL and an endogenous growth model have been used for the period starting from 1974 to 2016. Toda-Yamamoto test has been employed to verify the causality among the variables. The findings suggest long run cointegration between expenditure and revenue; and causality test confirming fiscal synchronization hypothesis for Ethiopia. The evidence supports long run and short run asymmetric relationship between real total government expenditure and real total revenue. The endogenous growth model estimates reveal that, a positive shock in fiscal deficit leads to positive change in GDP and when there is a negative shock, it reduces GDP. There is bi-directional causality running between GDP, human Capital and labour force. However, there is a unidirectional causality running from fiscal deficits to economic growth. In view of these findings the policy measures such as improving tax revenues and minimizing fiscal deficits have been suggested.

Keywords: Public expenditure, Revenue, Fiscal deficits, Economic growth, Asymmetric cointegration

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1. Introduction

The growing disparity between public expenditure and revenue causes rising fiscal deficits, which have a consequent negative impact on economic growth. Realizing the relationship between revenue and expenditure has become a crucial prerequisite for any effective fiscal consolidation process (Loloh and Amoah 2008). In addition, it deals with the adjustment of public revenue and expenditure in order to stabilize the economy. Fiscal sustainability studies usually assess the existence of a long-term cointegration relationship between government revenue and spending (Afonso&Rault, 2009, Soormo, 2020). To delineate the relationship between total revenue and expenditure there exist four schools of thought. They are: the tax and spend hypothesis, the spending and tax hypothesis, the fiscal synchronization hypothesis and the institutional separation hypothesis. Government policies in various countries depend on these hypotheses. However, until now, there exists no consensus among scholars about the relationship between these variables, similarly the impact of these variables on economic growth. In addition the nexus between fiscal deficits and economic growth is not scientifically explored using relevant theoretical models more so for a country like Ethiopia, where public expenditure is growing phenomenally without matching revenue generation.

Ethiopia has experienced several regime changes involving structural, political, and economic changes. During the monarchy of the 1930s, modern and new fiscal systems were introduced through several proclamations. The emperor announced a budgetary system that reflected the fiscal policy of the government. However, after 1974, there was a regime change, and during this period there was a substantive decline in economic growth caused by inefficient allocation of resources, destruction, political instability, and non-democratic governance (Chole and Manyazewal 1992). The main reason for the decline in growth was the decline in agricultural productivity. During this regime, fiscal deficits have risen significantly (7%), and government expenditure rose to 27% compared to 18% total revenue (Gebre, 1992). There was a regime change again in 1991, leading to a broad range of reforms and policy changes from command to liberalization. Public expenditure policy focused on financing reforms and developmental strategies, such as expenditures on civil service reform and capacity building; and research and development. After 1994, there was a significant shift in the emphasis of public expenditure policy in Ethiopia, allocation for defence spending continued to decline, while those on "core" government activities, most notably infrastructure, education, and health increased significantly World Bank (1994).The recent times witnessed another change (2018) that is committed more towards privatization and liberalized policies. The emphasisis laid on fiscal policy to increase tax revenues to meet the growing public expenditure caused by huge infrastructure and energy projects, maintenance of law and order and conflict management. The overall macroeconomic policy has been to encourage and implement several fiscal reforms to improve the revenue collection capacity and expenditure at both the federal and regional levels of the country. The objective of these fiscal reforms was to ensure sustainable economic growth and reduce poverty

through financing expenditure mainly from tax revenues and maintaining a budget deficit below 3% of GDP.

The main objective of this study is to verify whether Ethiopia's public expenditure and revenue are in long-run equilibrium, and the effect of the growing fiscal deficits on economic growth. The study is an empirical analysis of public expenditure and revenue, and the impact of fiscal deficits on economic growth in Ethiopia using asymmetric cointegration methods. The rest of this paper is organized as follows: The following section deals with theoretical and empirical literature review. Section three discusses data and methodology. Section four is on data analysis and findings. The final section presents the conclusions and policy suggestions.

2. Theoretical and Empirical Review

Using systematic literature survey on public expenditure and revenue nexus and the impact of fiscal deficits on economic growth for the period 2001 to 2021 we have chosen and reviewed the studies based on their importance, relevance and recentness of the publication. We have used Harzing's (2007) Publish and Perish software for this purpose. The studies included in the Google Scholar have been included.

Public expenditure and Revenue

Several theoretical and empirical studies are available on the public expenditure and revenue nexus. The 'tax and spend' hypothesis (Friedman, 1978),states that higher taxes imply more spending and reduce the budget deficits. This implies a positive relationship between government revenue and expenditure. Tax- spend hypothesis is a fiscal exchange model that envisages public finance to provide the levels of services chosen by citizens to secure their democratically determined negative and/or positive rights. Voter citizens make taxes and other such payments in exchange for services (Bailey, 2004). Contrarily, Buchanan and Wagner (1977) argue that there is a negative causal relationship between government revenue and expenditure. Thus, first government should generate the required optimum amount of revenue and then spend it according to the priority of a project (Al-Qudair, 2005; Elyasi and Rahimi, 2012, Gurdal et al, 2021). Bailey (2004) supports the Spend and tax hypothesis proposed by Peacock and Wiseman (1979) and contends that expenditure causes revenue. Musgrave (1966) and Meltzer and Richard (1981) argue that the governments should simultaneously increase the revenues and expenditures, which means that there is a bi-directional causal relationship between government revenue and expenditure. An institutional separation hypothesis was proposed by Baghestani and McNown (1994), which states that there should be a separation between government expenditure and revenue as they are independent decisions.

There are several empirical studies available providing evidence for the validity of these hypotheses. However there is no consensus as per the cause and effect relationship among these variables. Evidence for the tax-spend hypothesis can be seen in several studies. The government must improve its revenue generation efforts to fund its ever-increasing expenditure and to control

frequent fiscal slippages (Obeng, 2015). In a recent study, Tashevska and Trpkova (2020) provide evidence for a unidirectional relationship between government revenue and government expenditure using a bootstrap panel Granger causality approach for five Southeast European countries. Similar evidence was provided by Yinusa and Osemi (2017) for Nigeria using asymmetric condensation methods. A similar result was found for India(Mohanty, A. R., and Mishra, B. R. 2017).Ghumro (2014) also supports the spending to tax hypothesis for Pakistan.
The direction of causality running from government expenditure to government revenue is proved by Kazungu (2019) and Al-Qudair (2005) argued that the first government determines its expenditure according to its priority and then with revenue would be generated. Alehile (2012) provides evidence for long-run cointegration between government revenue and expenditure, supporting the causal relationship running from spending to tax revenue. Similarly, sseveral empirical studies have been conducted on physical synchronization. Examining the non-linear relationship between government revenues and government expenditures (Raja, et al, 2019) provided evidence in favor of the fiscal synchronization hypothesis. Similarly, Phiri (2009) supports bidirectional causality in revenues and expenditures. Using Narayanan and Popp structural break test, the CIPS panel unit root tests, Akram and Rath (2019) provided evidence for 'fiscal synchronization' hypothesis for Indian states. Similar evidence was found for segregated public expenditure and revenue also. Using the wavelet method, Mutascu (2017) claimed that government spending, taxes, and grants are asymmetrically cointegrated.

On Africa, Wolde Rufael (2008) provides mixed evidence for a bidirectional causality running between expenditure and revenue for Mauritius, Swaziland, and Zimbabwe; no causality in any direction for Botswana, Burundi, and Rwanda; unidirectional causality running from revenue to expenditure for Ethiopia, Ghana, Kenya, Nigeria, Mali, and Zambia; and unidirectional causality running from expenditure to revenue for Burkina Faso only. There exist very few studies on the relationship between public expenditure and revenue o Ethiopia and there are no studies using asymmetric cointegration models. Examining the relationship between government revenue and the expenditure in Ethiopia, Eshetu (2016), concludes that government expenditure should be accompanied by revenue and control measures to ensure fiscal sustainability in Ethiopia.

Fiscal deficits and Economic growth

A huge fiscal deficit leads to the creation of extra money causing inflation, which leads to credit squeezing through higher interest rates and crowds out private investment, and external debt leads to an increase in the tax rate, which will discourage investment and cause a current deficit with appreciation of the real exchange rate (Oblath, 1995; Easterly and Schmidt-Hebbel ,1993). Neoclassical economists argue that fiscal deficits have a detrimental effect on economic growth (Bernheim, 1989).While, Ricardian equivalence (Ricardo, 1817) states that fiscal deficits are neutral to economic growth. Several studies indicate that fiscal deficits affect the macro economy adversely, particularly GDP growth (Ramu and Gayithri, 2016; Rana and Wahid, 2016). Ekong (2016) finds a positive relationship between fiscal deficits and economic growth in Sierra Leone

and found a positive relationship between budget deficits and economic growth. The evidence for negative impact is provided by Tung (2018) and there is a cointegrated relationship between these variables; fiscal deficits affecting economic growth adversely both in the short and long run (Tung, 2018). Sometimes, different datasets provide different results (Hussain and Haque, 2017). Empirical findings also suggest mixed and contradicting evidence on this relationship. Government budget deficit had a statistically significant negative impact on economic growth in Bangladesh (Hussain and Haque, 2017) and no significant impact of the budget deficit on Pakistan's economic growth (Nayab (2015). The impact of fiscal deficits (FSD) on economic growth could be different in different regimes (Edame and Okoi (2015). Thus available evidence on fixed deficits impact on economic growth is mixed as well as contradicting. It seems no study is available on Ethiopia about this relationship using asymmetric cointegration models.

3. Data and Methodology

This study is quantitative and uses time-series annual data from 1975 to 2016 extracted from the National Bank of Ethiopia. The data are collected on the variables in real terms and tested for the presence of unit roots, serial correlation, heteroscedasticity and normality. Real gross domestic product (RGD), real fiscal deficit (RFD), and the real human capital expenditure (RHC) (total capital expenditure on education and health is used as a proxy). The total labor force (LF) (percentage of population of age group of 15-64 is used as proxy).

Different methods have been advocated to verify the long-run relationship between variables. Among the conventional and well-known co-integration methods, Engle Granger (1987) residual-based test, Johansen (1988) system-based test, error correction method (ECM) vector error correction method (VECM), and autoregressive distributed lag (ARDL) are the major methods applied by several scholars. The autoregressive distributed lag (ARDL) model is more popular because it can be used when variables are integrated at different orders such as I (1), I (0) and not I (2). The long-and short-run parameters can be estimated simultaneously, and is more robust and performs better for small sample sizes (Hundie, 2014). The main purpose of time series analysis is to study the dynamic features of series over a short-and long-term period, and to analyse the relationship between variables, whether linear or nonlinear. Most of the conventional cointegration methods assume a linear relationship, which is not always true. The ARDL model also cannot handle the nonlinear relationships which are very common in economic problems. In the case of a nonlinear relationship, the effect of one variable the other variable may have unpredictable dynamic effects over a short period and a long period of time.

Nonlinear ARDL cointegration approach (NARDL) is an asymmetric extension to the popular ARDL model (Pesaran and Shin, 1999) and Pesaranet al.2001), it captures both long run and short run asymmetries in a variable of interest. The nonlinear ARDL approach is crucial to assert the friction of a change or shock in a given variable that tends to an increase or decrease in other

variable owing to the effects of events that occur suddenly. It incorporates asymmetry both in the long run and short run relationship and at the same time, it captures asymmetries in the dynamic adjustment as well as it allows regressing I (0) and I (1) order of the variables. Non-linear ARDL represents the simplest method of modeling combined short-and long-run asymmetries (Shin Yongcheol, 2014). One of the advantages of the NARDL model is the synchronized discrepancy between the short-term and long-term effects of the exogenous variables on the dependent variables (Tursoy, Faisal, Berk, and Shahbaz 2018). Following Meo (2018), this study applies NARDL to verify the long-run relationship between total government expenditure and total revenue. To assess the asymmetric effects the model was developed as follows:

$$RTR_{t=}\alpha_0 + \beta^+{}_1 \mathrm{RTGEX}^+{}_t + \beta_2{}^- \mathrm{RTGEX}_t{}^- + \mu_t \quad \ldots\ldots (1)$$

$$\mathrm{RTGEX}_{t=}\alpha_0 + \beta^+{}_1 \mathrm{RTR}^+{}_t + \beta_1{}^- \mathrm{RTR}_t{}^- + \mu_t \quad \ldots\ldots (2)$$

The general form of the model is:

$$RTR_{t=}\alpha_0 + \gamma \mathrm{RTR}_{t-1} + \beta^+{}_1 \mathrm{RTGEX}^+{}_{t-1} + \beta_2{}^- \mathrm{RTGEX}_{t-1}{}^- + \sum_{t=1}^{p} \delta_t \mathrm{RTR}_{t-i} + \sum_{t=0}^{q} \theta_i \mathrm{RTGEX}^+{}_{t-1} + \sum_{t=0}^{q} \theta_i \mathrm{RTGEX}^-{}_{t-1} + \mu_t \ldots\ldots (3)$$

$$RTGEX_{t=}\alpha_0 + \gamma \mathrm{RTGEX}_{t-1} + \beta^+{}_1 \mathrm{RTR}^+{}_{t-1} + \beta_2{}^- \mathrm{RTR}_{t-1}{}^- + \sum_{t=1}^{p} \delta_t \mathrm{RTGEX}_{t-i} + \sum_{t=0}^{q} \theta_i \mathrm{RTR}^+{}_{t-1} + \sum_{t=0}^{q} \theta_i \mathrm{RTR}^-{}_{t-1} + \mu_t \ldots\ldots (4)$$

Where α, γ, β, δ, and θ are parameters to be estimated, RTR is real total revenue, and RTGEX is real total government expenditure.

The following steps have been followed to verify the relationship between real total revenue and real total government expenditure for equation (1):

1. Long-run coefficient: We estimated the long-run coefficient of RTGEXt+ by dividing the negative of the coefficient of RTGEXt+, β1+by the coefficient of RTRt-1, γ, and the long-run coefficient of RTGEX-t-1 by dividing the negative of the coefficient of RTGEX-t-1, β2 by the coefficient of RTRt-1, γ. (-β1+/ γ) and (-β2-/ γ) are the long-run coefficients of RTGEXt+ and RTGEX-t, respectively.
2. Asymmetric co-integration test: A long-run relationship or cointegration is present if the joint null hypothesis γ = β1+ = β2- = 0 is rejected when the critical values are the same as the critical values for ARDL.
3. Testing Symmetry: If the long-run coefficients (-β1+/ γ) and (-β2-/ γ) are not the same, then there is asymmetry in the long run. Therefore, we test the null hypothesis of (-β1+/ γ) = (-β2-/ γ). If the null hypothesis is rejected, then there is evidence of long-run asymmetry in the model. The same procedure was applied to Equation (2).
4. To verify the causality among the variables, the Toda-Yamamoto (1995) Granger causality test was used. The Toda-Yamamoto Granger causality test can be applied irrespective of the integration and co-integration properties of the model. The method suggests a technique that requires the estimation of an augmented VAR that assures the asymptotic

distribution of the Wald statistic (an asymptotic $\chi 2$ distribution), since the testing procedure is robust to the integration and co-integration properties of the process (Alimi & Ofonyelu, 2013). The basic idea behind the Toda-Yamamoto Granger causality test is to artificially augment the correct VAR order, k, with dmax extra lags, where dmax is the maximum likely order of integration of the series in the system (Hundie, 2014, p. 5). The test has to be conducted in two steps: First, with VAR, the optimum lag length (m) should be decided, and the second, the maximum order of integration (dmax) for the variables should be decided. The study used a bivariate VAR (m + dmax) model following Alimi and Ofonyelu (2013) to verify the causal relationship between total public revenue and total public expenditure.

The Toda Yamamoto causality test can be presented as follows:

$$RTR_{t=}\alpha_0 + \sum_{i=1}^{m}\beta_1 \mathrm{RTR}_{t-i} + \sum_{i=m+1}^{m+dmax}\beta_2 \mathrm{RTR}_{t-i} + \sum_{i=1}^{m}\beta_3 \mathrm{RTGEX}_{t-i} + \sum_{i=m+1}^{m+dmax}\beta_4 \mathrm{RTGEX}_{t-i} + \mu_t \ldots\ldots \quad (5)$$

Where RTR is real total revenue, RTGEX is real total government expenditure, ε is an error, α0 and α 1 are intercepts, β1 – β4, and δ1–δ4 are coefficients of the parameters.

Fiscal deficits and Economic growth: An endogenous growth model

To verify the impact of fiscal deficit on economic growth, the study used the non-linear autoregressive distributed lag (NARDL) model and the Toda-Yamamoto Granger causality test as explained above. We employed an endogenous economic growth model following expenditure approach of GDP along with other variables such as human capital and labor force. The endogenous growth model specified is as follows:

GDP= f (Fiscal Deficit, Human Capital, and Labor Force).

In estimable form the model is:

$$\begin{aligned}\mathrm{RGDP}_{t=}\alpha_0 + \beta_1 \mathrm{RGDP}_{t-1} + \beta^{+}{}_2 \mathrm{RFD}^{+}{}_{t-1} + \beta_3{}^{-}\mathrm{RFD}_{t-1}{}^{-} + \beta^{+}{}_4 \mathrm{RHC}^{+}{}_{t-1} + \beta_5{}^{-}\mathrm{RHC}_{t-1}{}^{-} \\ + \beta^{+}{}_6 \mathrm{LF}^{+}{}_{t-1} + \beta_7{}^{-}\mathrm{LF}_{t-1}{}^{-} + + \sum_{t=1}^{p}\beta_8 \mathrm{RGDP}_{t-i} + \sum_{t=0}^{q}(\gamma_i^{+}\mathrm{RFD}^{+}{}_{t-1} \\ + \gamma_i^{-}\mathrm{RFD}^{-}{}_{t-1}) + \sum_{t=0}^{q}(\delta_i^{+}\mathrm{RHC}^{+}{}_{t-1} + \delta_i^{-}\mathrm{RHC}^{-}{}_{t-1}) + \sum_{t=0}^{q}(\theta_i^{+}\mathrm{LF}^{+}{}_{t-1} \\ + \theta_i^{-}\mathrm{LF}^{-}{}_{t-1}) + \mu_t \quad \ldots. \quad (6)\end{aligned}$$

Where α, γ, β, δ, and θ are parameters to be estimated, RGDP represents the real gross domestic product, RFD is the real fiscal deficit, and RHC is the real human capital. LF is the total labor force. All variables are the first differences of the natural logarithmic form.

The Toda Yamamoto causality test is as follows:

$$\begin{aligned}\mathrm{RGDP}_{t=}\alpha_0 + \sum_{i=1}^{m}\beta_1 \mathrm{RGDP}_{t-i} + \sum_{i=m+1}^{m+dmax}\beta_2 \mathrm{RGDP}_{t-i} + \sum_{i=1}^{m}\beta_3 \mathrm{RFD}_{t-i} + \sum_{i=m+1}^{m+dmax}\beta_4 \mathrm{RFD}_{t-i} \\ + \sum_{i=1}^{m}\beta_5 \mathrm{RHC}_{t-i} + \sum_{i=m+1}^{m+dmax}\beta_6 \mathrm{RHC}_{t-i} + \sum_{i=1}^{m}\beta_7 \mathrm{LF}_{t-i} + \sum_{i=m+1}^{m+dmax}\beta_8 \mathrm{LF}_{t-i} \\ + \mu_t \quad \ldots\ldots (7)\end{aligned}$$

4. Data Analysis and Findings

Prior to estimating models, ADF unit root test was conducted to verify the stationarity in the series. The test results reveal that total real revenue (RTR) and total real government expenditure (RTGE) are stationary at the first difference level.

Table1: Unit root test

	RTR	**RTGE**
	t-StatPro.*	t-StatPro.*
ADF test statistic	-4.727 (0.000)	-6.711 (0.000)

Source: Computed

Note: * indicates significance at 5% level

The maximum lag length was computed using various criteria, and the selected lag length for total revenue and government expenditure was 8. After choosing the optimum lag length, an asymmetric ARDL model was estimated using the following model.

$$RTR_{t=}\alpha_0 + \gamma \mathrm{RTR}_{t-1} + \beta^{+}{}_1 \mathrm{RTGEX}^{+}{}_{t-1} + \beta_2{}^{-} \mathrm{RTGEX}_{t-1}{}^{-} + \sum_{t=1}^{p} \delta_t \mathrm{RTR}_{t-i} + \sum_{t=0}^{q} \theta_i \mathrm{RTGEX}^{+}{}_{t-1} + \sum_{t=0}^{q} \theta_i \mathrm{RTGEX}^{-}{}_{t-1} + \mu_t \quad \ldots\ldots (8)$$

Where, the variables have the same meaning, as explained above. The results of the estimated model are presented below:

Table 2: Asymmetric Cointegration: RTGEX on RTR

Long run effect [+]				**Long run effect [-]**			
Exo.var.	Coef.	F-stat	P>F	Exo.var.	Coef.	F-stat	P>F
RTGEX	1.126	25.770	0.000		-1.434	27.740	0.000
	Long-run asymmetry				**Short-run asymmetry**		
	F-stat	P>F			F-stat	P>F	
	5.905	0.029			1.325	0.269	
				Cointegration test statistics:			
				t_BDM = -2.7057, F_PSS = 6.203			

Source: Computed

The model diagnostics are presented in the following table:

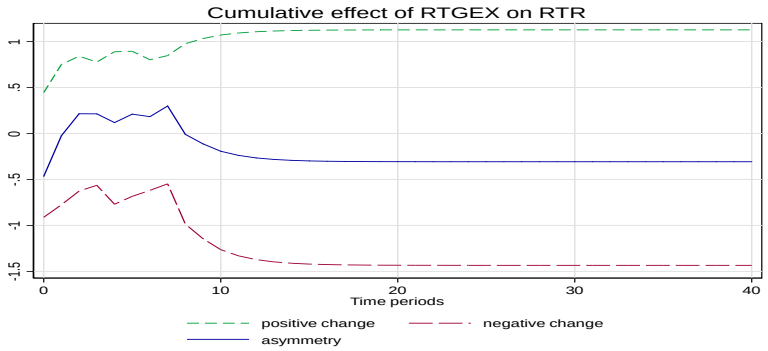
Table 3: Model diagnostics

Model diagnostics	**Stat.**	**p-value**
Portmanteau test up to lag 15 (chi2)	8.942	0.8805
Breusch-Pagan Heteroskedasticity test (chi2)	2.064	0.150
Ramsey RESET test (F)	.851	0.494
Jarque-Bera test on normality (chi2)	.187	0.910

Source: Computed

As indicated in Table 3, the model has satisfied all the diagnostics tests as there is hetroscedasticity, non-normality, auto- correlation and specification problem. Since the co-integration test statistic of F_PSS (6.203) is above the critical values for the upper bound test, at 5% of significance level I (6.135), there is a long-run relationship between total revenue and total government expenditure. There is a significant positive and negative long-run effect of real total government expenditure on real total revenue indicating the positive relationship between these variables. And, there is a significant long run asymmetric relationship between real total government expenditure and real total revenue. The same thing can be presented as in the following figure:

Figure1: Cumulative effect of RTGEX on RTR



Source: computed

The results of the asymmetric cointegration of RTR on RTGEX are presented in the following table:

Table2: Asymmetric Cointegration: RTR on RTGEX

	Long-run effect [+]			**Long-run effect [-]**		
Exog. Var.	coef	F-stat	P>F	coef	F-stat	P>F
RTR	1.106	47.350	0.000	-0.369	4.503	0.052
	Long-run asymmetry			**Short-run asymmetry**		
	F-stat	P>F		F-stat	P>F	
RTR	49.540	0.000		6.546	0.023	
				Co-integration test statistics:		
				t_BDM =-3.397, F_PSS =6.422		

Source: Computed

The model has satisfied all the diagnostics tests as there is no hetroscedasticity, non-normality, auto- correlation and specification issues. Since the co-integration test statistic of F_PSS (6.4223) is above the critical values for the upper bound test, at 5% of significance level I (6.135), there is a long-run relationship between total revenue and total government expenditure.

There are both positive and negative long-run effects from real total revenue to real total government expenditure. As a positive effect, when real total revenue changes, real total government expenditure will change positively. As a negative effect, when real total revenue decreases real total government expenditure also decreases. The result also indicates that there is a long-run as well as short-run asymmetric relationship between real total government expenditure and real total revenue.

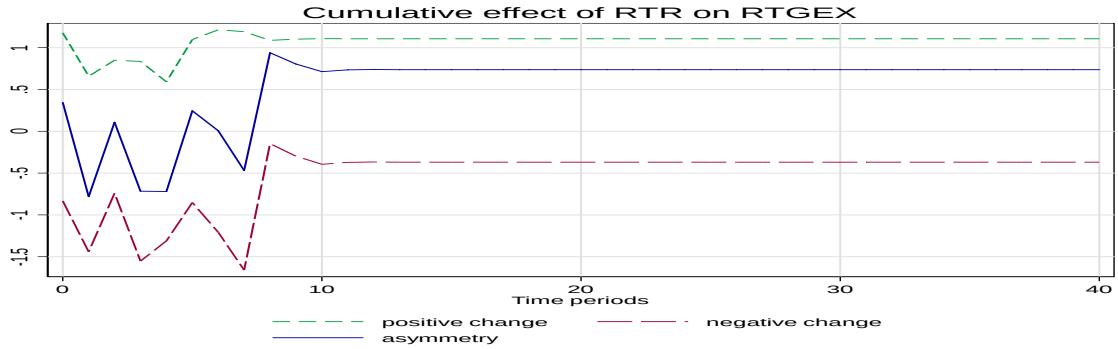
Table5: Model Diagnostics

Test	stat.	p-value
Portmanteau test up to lag 15 (chi2)	20.28	0.1613
Breusch-Pagan heteroskedasticity test (chi2)	0.2107	0.6462
Ramsey RESET test (F)	1.766	0.2116
Jarque-Bera test on normality (chi2)	1.106	0.5753

Source: Computed

The following figure presents the cumulative effect.

Figure2: Cumulative effect of RTGEX on RTR



Source: Computed

The causational relationship is verified using Toda-Yamamoto test.

Table 6: Toda-Yamamoto causality test

Dependent Variable: RTR		**(Wald Test)**
Excluded	Chi-sq	Prob.
RTEX	14.662	0.066
All	14.662	0.066
Dependent Variable:RTEX		
Excluded	**Chi-sq**	**Prob.**
RTR	18.937	0.015
All	18.937	0.015

Source: Computed

The evidence suggests that the real total revenue and real total government expenditure are asymmetrically cointegrated and there is a bidirectional causal relationship in the long run supporting fiscal synchronization hypothesis. These results are similar to the earlier such as Eshetu (2016) and Wolde Rufael (2008),and Aladejare and Ani (2012) for Nigeria, Al-Qudair (2005) for Kingdom of Saudi Arabia, Paleologou (2013) for Sweden.

The Impact of fiscal deficits on economic growth

To measure the impact of fiscal deficits on economic growth the following model is estimated.

$$\begin{aligned}\mathrm{RGDP}_{t=}\alpha_0 + \beta_1\mathrm{RGDP}_{t-1} + \beta^{+}{}_2\mathrm{RFD}^{+}{}_{t-1} + \beta_3{}^{-}\mathrm{RFD}_{t-1}{}^{-} + \beta^{+}{}_4\mathrm{RHC}^{+}{}_{t-1} + \beta_5{}^{-}\mathrm{RHC}_{t-1}{}^{-} \\ + \beta^{+}{}_6\mathrm{LF}^{+}{}_{t-1} + \beta_7{}^{-}\mathrm{LF}_{t-1}{}^{-} + + \sum_{t=1}^{p}\beta_8\mathrm{RGDP}_{t-i} + \sum_{t=0}^{q}(\gamma_i^{+}\mathrm{RFD}^{+}{}_{t-1} \\ + \gamma_i^{-}\mathrm{RFD}^{-}{}_{t-1}) + \sum_{t=0}^{q}(\delta_i^{+}\mathrm{RHC}^{+}{}_{t-1} + \delta_i^{-}\mathrm{RHC}^{-}{}_{t-1}) + \sum_{t=0}^{q}(\theta_i^{+}\mathrm{LF}^{+}{}_{t-1} \\ + \theta_i^{-}\mathrm{LF}^{-}{}_{t-1}) + \mu_t\end{aligned}$$

Where α, γ, β, δ, and θ are parameters to be estimated, RGDP represents the real gross domestic product, RFD is the real fiscal deficit, and RHC is the real human capital expenditure. LF is the total labor force. All variables are measured as the first natural log differences.

Table 7: Unit root test: RGDP, RFD, RHCEXP, and LF

ADF	First difference RGDP		First difference RFD		First difference RHCEXP		First difference LF	
	t-Statistic	Prob.	t-Statistic	Prob.	t-Statistic	Prob.	t-Statistic	Prob.
	-6.81(0.000)		-8.696	(0.000)	-6.244(0.000)		-3.532	(0.012)
1% level	-3.606		-3.606		-3.606		-3.606	
5% level	-2.937		-2.937		-2.937		-2.937	
10% Level	-2.607		-2.607		-2.607		-2.607	

Source: Computed

As Table 7 indicates, all variables are stationary at the difference order I (1). Since all variables are stationary at the order I (1), it is possible to estimate the long-run cointegration.

Table3: Optimum lag length

VAR Lag Order Selection

Endogenous variables: RGDP RFD RHCEXP LF

Exogenous variables: C

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-769.6872	NA	2.00e+12	39.67627	39.84689	39.73748
1	-624.3598	253.3914	2.65e+09	33.04409	33.89720*	33.35018
2	-610.3973	21.48071	3.03e+09	33.14858	34.68417	33.69954
3	-576.9056	44.65566*	1.33e+09*	32.25157*	34.46965	33.04740*

* Indicates the lag order selected

Source: Computed

Table4: Asymmetric Cointegration: RGDP RFD RHCEXP LF

Asymmetry statistics

	Long-run effect [+]			**Long-run effect [-]**		
Exog.var.	Coef	F-stat	P>F	Coef	F-stat	P>F
RFD6.410	35.6100.000			-1.767	2.522	0.141
RHCEXP 28.603	9.911	0.009		-98.019	22.990	0.001
LNLF2	1073.332	7.686	0.018	-576.216	10.790	0.007
Long-run asymmetry				**Short-run asymmetry**		
F-statP>F				F-statP>F		
RFD	18.670		0.001	0.01	0.977	
RHCEXP	20.860		0.001	0.307	0.590	
LNLF2	2.041		0.181	22.690	0.001	
				Cointegration test statistics: t_BDM = -3.7455, F_PSS = 7.0672		

Source: Computed

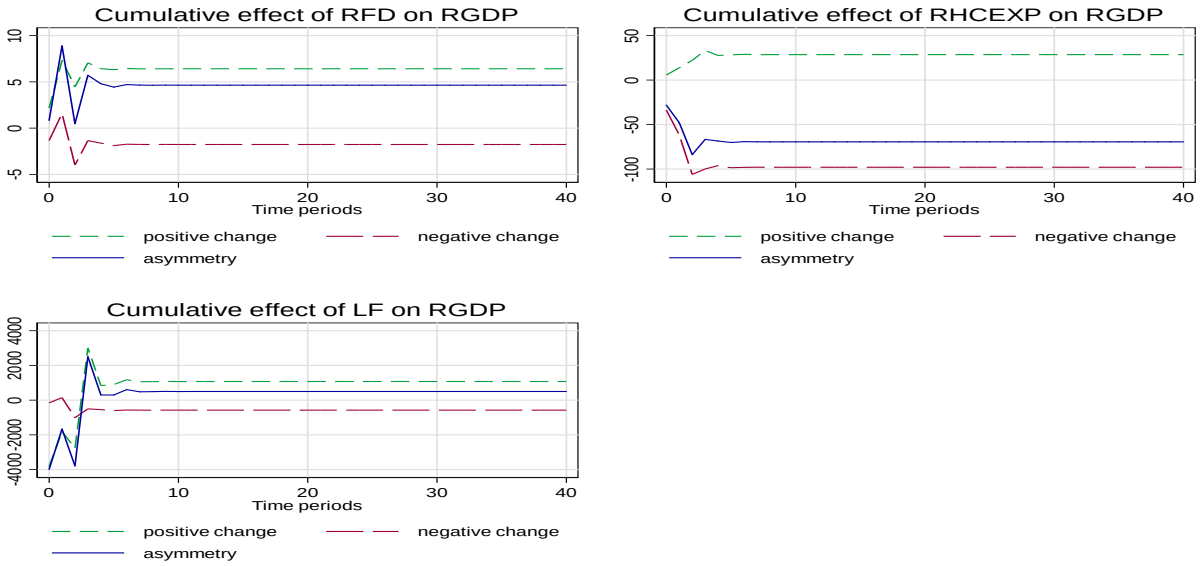
Table 8: Model Diagnostics

Test statistic	**Stat.**	**p-value**
Portmanteau test up to lag 16 (chi2)	25.96	0.0751
Breusch -Pagan heteroskedasticity test (chi2)	.3744	0.5406
Ramsey RESET test (F)	4.003	0.0612
Jarque-Bera test on normality (chi2)	4.706	0.0951

Source: Computed

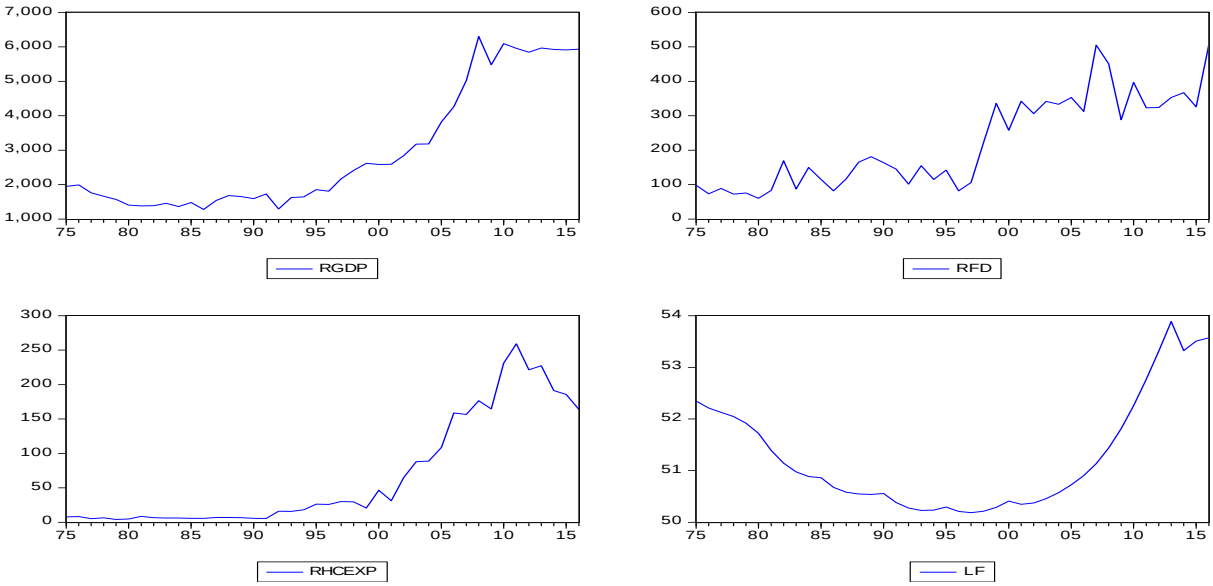
From Table 8, the co-integration test that F_PSS (7.0672) is greater than the critical values for the upper bound test in case III unrestricted intercept and no trend at 5% of significance level I (4.083), there is a long-run cointegration among variables. In the long-run positive effect, fiscal deficit and labor force are statistically significant. However, human capital was statistically insignificant. Hence, fiscal deficit and labor force change as positive long-run effect three will be a positive change in growth (real gross domestic product). In the long-run negative effect, fiscal deficit is not statistically significant, but human capital and labor forces are significant. Thus, as human capital and labor forces are reduced or less growth (gross domestic product) will lead to a decline. Furthermore, there is a long-run asymmetry in both fiscal deficit and human capital associated with growth. However, there is only short-run asymmetry in labor force and growth..

Figure 2: Cumulative effect on GDP



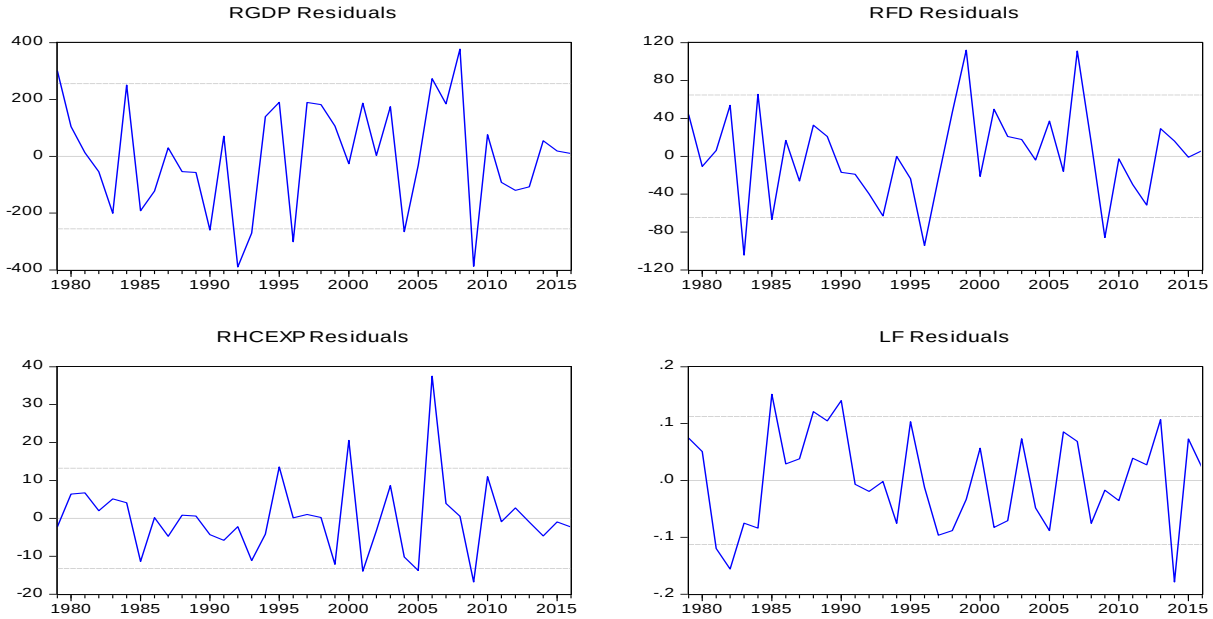
Source: Computed

Figure 3: Cumulative effect: RGDP RFD RHCEXP LF



Source: Computed

Figure 4: Residuals: RGDP RFD RHCEXP LF



Source: Computed

Table 9: VAR Causality test

Dependent variable: RGDP			
Excluded	Chi-sq	Df	Prob.
RFD	9.407932	3	0.0243
RHCEXP	9.547567	3	0.0228
LF	6.612385	3	0.0853
All	25.28626	9	0.0027
Dependent variable: RFD			
Excluded	Chi-sq	Df	Prob.
RGDP	4.207013	3	0.2400
RHCEXP	3.007572	3	0.3905
LF	8.492194	3	0.0369
All	14.81373	9	0.0962
Dependent variable: RHCEXP			
Excluded	Chi-sq	Df	Prob.
RGDP	10.69783	3	0.0135
RFD	3.242826	3	0.3557
LF	3.353433	3	0.3403
All	34.14679	9	0.0001

Source: Computed

From Table 9, the results of the Toda-Yamamoto Granger causality test revealed unidirectional causality in the long-run relationship from fiscal deficit to GDP. However, GDP has a bidirectional causal relationship with human capital and labor force.

5 Conclusion and Policy Implications

The results of the NARDL and Toda-Yamamo causality tests on the nexus between real total revenue and real total government expenditure indicated that there is an asymmetric co-integration and bidirectional causality in the long run. There is a long-run asymmetric and as well as short-run asymmetric relationship running from real total government expenditure to real total revenue. However, there is only a long-run asymmetric relationship running from total government expenditure to total tax revenue. The evidence thus supports fiscal synchronization hypothesis for Ethiopia. Similarly, fiscal deficit had positive long run effect on economic growth but statistically not significant. Similarly, Human capital had a positive long-run effect which is statistically not significant. However, GDP hada long-run asymmetry with fiscal deficit and human capital. Similarly, there is no long-run asymmetry between labor force and growth. However, the labor force has both a long-run positive effect and a long-run negative effect on economic growth. On the other hand, the Toda-Yamamoto Granger causality test revealed unidirectional causality running from fiscal deficit to GDP.

Policy Implications

Understanding the nexus between government expenditure and revenue, and the impact of fiscal deficits on economic growth is essential for the effective implementation of fiscal policies. The relationship between total revenue and expenditures is characterized by the fiscal synchronization hypothesis. Since the findings indicate the positive relationship between fiscal deficit and economic growth in Ethiopia, the government should rationalize its expenditure by controlling and limiting the current expenditure and prioritizing capital expenditure. It also should aim at improving the tax revenues such that fiscal deficits can be minimized.

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