




THE NEXUS BETWEEN GOVERNMENT EXPENDITURE AND REVENUE IN TANZANIA



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ABSTRACT

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This study examines the long run relationship and the direction of causality between government revenue and government expenditure in Tanzania by using quarterly data spanning the period between 2000 and 2017. The study employed Augmented Dickey Fuller test, Johansen Cointegration, Unrestricted VAR model, Granger Causality test, Impulse Response Function and Variance Decomposition. In doing so, four hypotheses are subjected to empirical test, namely; tax-spend, spend-tax, fiscal synchronization, and fiscal neutrality. The results from both trace and maximum eigenvalue statistics clearly accept the null hypothesis that there is no cointegration between revenue and expenditure. Moreover, the Granger Causality test indicates that the direction of causality runs from government expenditure to government revenue, implying that government determines expenditure prior to its revenue. These results suggest that other three hypotheses are strongly rejected, corroborating spend-and tax hypothesis as postulated by Barro (1974), Peacock and Wiseman (1979) and Hondroyannis and Papapetrou (1996).

Contribution/ Originality: This study contributes to the existing body of knowledge in two major dimensions. First, it provides insights to the policy makers to rethink the preparations of government budget process in Tanzania. Secondly, this study contributes to the existing empirical literature by using Tanzanian data set.

1. INTRODUCTION

The relationship between government revenues and government expenditures has been explored exhaustively by many academicians and researchers over the last decades. The concern emanates largely from the fact that many governments suffer from persistent budget deficits. Uncontrolled fiscal disparity may lead to unsustainable growth in output, income and employment which are considered to be important components of economic growth. On the one hand, budget deficit is not necessarily regarded as bad thing since it can foster rapid economic growth (Amoah and Loloh, 2008). On the other hand, some scholars believe that budget deficits have adverse effects on savings, investment, and public debt which could inhibit economic growth. In view of this, one could plausibly argue that, a thoroughly understanding of the relationship between government revenues and government expenditure is of paramount importance in the formulation of fiscal policy for a sustainable economic growth and poverty reduction. According to the available literature four hypotheses have been developed on the study of relationship between government revenue and expenditure. These are: tax-spend, spend-tax, fiscal synchronisation and fiscal neutrality.

Tanzania, like many other developing countries has been facing sustained budget deficits over the decades. Indeed, a cursory glance at available statistics indicates that government expenditure has invariably fallen short revenue for the last decade or so, although the revenue has also been steadily growing for a couple of years. Moreover, despite the impressive performance of domestic revenue mobilization, the gap between resources and expenditure has continued to burgeon leading to ever expanding into deficit. Intuitively, this could be exacerbated by the rapid increase of government investments in infrastructural projects, such as roads, ports, airports and power generation. Notwithstanding the observed trajectory on the revenue-expenditure gap, it is shocking to note that limited literature exists on this area and no study has attempted to test empirically the relationship between these two fiscal variables; nor is there any study that has attempted to test the direction of causality between revenue-expenditure nexus in Tanzania.

Against this backdrop, the objectives of this study are twofold. First, to examine the short run and long run relationship between revenue and expenditure in Tanzania for the period 2000 – 2017, exploiting quarterly data. This is achieved through the estimation of VAR in the context of Johansen Cointegration test. Second, to test the direction of causality by using the Granger Causality Test. The empirical results show that there is a no long-run equilibrium relationship between government expenditure and government revenue. Moreover, Granger causality test based on the estimated VAR indicates government spending unidirectional and significantly granger-cause revenue in the short run. These results suggest that other hypotheses are strongly rejected in favour of the spend-and-tax hypothesis in case of Tanzania. Interestingly, this result is not inconsistent with the findings reported by Barro (1974), Peacock and Wiseman (1979) and Hondroyannis and Papapetrou (1996).

This study contributes to the existing body of knowledge in two major dimensions. First, it provides insights to the policy makers to rethink the preparations of government budget process in Tanzania. This will help policy makers to identify sources of existing fiscal imbalances in Tanzania, and in designing appropriate reform in order to address squarely fiscal imbalances. Secondly, this study contributes to the existing empirical literature by using Tanzanian data set.

The remainder of the study is organized as follows. Section two reviews the literature. Section three presents methodological aspects employed in the study while section four provides empirical findings and discussion. Section five concludes the study and gives policy implications.

2. LITERATURE REVIEW

Typically, there are four schools of thought regarding the revenue-expenditure nexus, namely the tax-spend, spend-tax, fiscal synchronization and fiscal neutrality. The underlying assumption in the tax-and-Spend hypothesis posits that changes in state revenues lead to changes in government expenditure, . Put it differently, tax-and-Spend school of thought generally hypothesizes a positive causal relation running from revenue to spending. This hypothesis was engineered by Friedman (1978) who argues that when government revenues are increasing, the government expenditures also get increased and hence a fiscal imbalance. In other words, an increase in tax revenues leads to budget deficit. According to Friedman, revenue cut is a concubine of budget deficit. Viewing from the other angle, Narayan (2005) argues that raising taxes leads to more expenditure. This argument is echoed by Young (2009) who postulates that the government desire to spend is always there that is why it consumes whatever is available. On the contrary, Buchanan and Wagner (1978) suggest that the causal relationship between government revenue and expenditure is negative. Their argument hinges on the ground that when taxes are cut the tax payers will perceive that the cost of government services has fallen and hence raise demand for more programmes from the government which if undertaken will result in an increase in government spending. This fiscal illusion is substantiated by Blackley (1986) and Bohn (1991).

The second school of thought dubbed as spend-and-tax hypothesis was developed in a seminal work by Barro (1974) and Peacock and Wiseman (1979). These authors postulated that government determines expenditure prior

to its revenue. In other words, the level of governments spending is determined first and then tax policy and revenue are adjusted to accommodate the required government expenditures. As a result, there is a unidirectional causality running from government expenditure to revenues. Among others, [Ewing and Payne \(1998\)](#) confirmed the existence of the causal link between the two variables. Likewise, [Anderson *et al.* \(1986\)](#) carried out granger causality test and substantiated that change in government expenditure lead to change in total revenue.

[Meltzer and Richard \(1981\)](#) propounded a third hypothesis known as fiscal synchronization. They argue that there is bi-directional causality between government revenue and government expenditure. This implies that government makes simultaneously its revenues and expenditure. According to Meltzer and Richard, appropriate decision regarding the level of government expenditure and government revenue is made based on marginal benefit and marginal costs of the services provided by the government.

[Baghestani and McNown \(1994\)](#) introduced the fourth hypothesis regarding causal relationship termed as institutional separation. The argument follows that decisions to spend and raise revenue are taken independently. Stated differently, there is no causality between the two variables. Clearly, in view of the above, the direction of causality between government revenue and expenditure remain inconclusive, and to be able to ascertain such empirical regularity econometric test is inevitable. This is what we review in the next paragraphs.

[Nyamongo *et al.* \(2007\)](#) investigated the relationship between government expenditure and government revenue in South Africa within the framework of a VAR approach. The estimation results showed that in the long run, there was evidence of bidirectional Granger causality, the finding which corroborate fiscal synchronisation hypothesis. Nonetheless, this study failed to establish Granger causality between government revenue and government expenditure in the short term.

[Maynard and Guy \(2009\)](#) explored the linkage between government expenditure and tax revenue in Barbados using both bivariate and multivariate cointegrating techniques. The Granger Causality was further invoked in order to determine the causal relationship in the multivariate model. The estimated results from the multivariate error correction model revealed that government expenditure Granger-cause changes in revenue. Striking the right balance between government revenue and expenditure is recommended.

[Elyasi and Rahimi \(2012\)](#) examined the causal relationship between government revenue and government expenditure in Islamic Republic of Iran by employing the bounds testing approach to cointegration. Empirical findings showed that there was a bidirectional causal relationship between government expenditure and revenues in both long run and short run during the period under study. These findings are not inconsistent with fiscal synchronization premise. These authors argue that authorities in Islamic Republic of Iran should endeavor to mobilize government revenues and simultaneously decrease expenditure in order to curb budget deficits.

[Dada \(2013\)](#) carried out a study to establish the causality between government expenditure and government revenue in Nigeria. The study used annual data and employed co-integration statistical method and vector autoregressive techniques comprising an Error Correction Model (ECM) and Augmented Dickey Fuller as the methods of analyses. The findings showed that there is spend-revenue practice.

[Lojanica \(2015\)](#) analyzed the relationship between government revenue and expenditure in the Republic of Serbia, using ARDL and VECM models. Empirical findings showed that in the long run there was a unidirectional causality from government expenditures towards government revenues during the period under study, supporting a spend-revenue hypothesis.

[Obeng \(2015\)](#) analysed the long-run relationship between government expenditure and government revenue using the Ordinary Least Squares (OLS) method and Vector Autoregressive (VAR). The results showed a very strong long-and short-run relationship between the variables. Granger causality test indicated a unidirectional causality running from revenue to expenditure. Therefore, evidence of Tax-spend hypothesis was confirmed. In a similar fashion, [Saysombath and Kyophilavong \(2013\)](#) discovered a long-run causality between government

spending and revenue in Lao PDR. The causality was unidirectional from spending to revenue, which supports the spend-and-tax hypothesis.

In view of the above, the empirical evidence remains mixed. The empirical findings on the relationship between government expenditure and revenue largely hinges on the nature of country idiosyncratic, model specification and estimation technique used. To the best of our knowledge, this is the first study in Tanzania to explore such relationship by using quarterly data spanning from 2000 up to 2017.

3. METHODOLOGY

The study employed quarterly time series data covering the period between 2001-2017 which were obtained from the Bank of Tanzania website (www.bot.go.tz). The logarithm of government revenue and government are used to determine the relationship between the Government revenue and Government expenditure).

In the first step, this study employs the Augmented Dickey-Fuller (ADF) to test the unit root on data set. Secondly, the Johansen cointegration test is employed. This test examines the existence of a long-run relationship between revenue and expenditure in Tanzania. Third, the Granger causality test is employed to determine the direction of causality between revenue and expenditure in Tanzania. Fourth, this study uses impulse response functions test in order to gauge the impact of one time shock in one of the innovations on current and future values of the endogenous variables. Finally, variance decomposition is employed in order to establish the proportion of a forecast horizon error variance in one variable explained by a shock in itself and the other variables.

3.1. Augmented Dickey-Fuller (ADF) Test

As alluded earlier, this study first and foremost carries out ADF unit root test in order to examine the stationarity of our data set as part of an empirical strategy within the context of time series analysis. Broadly speaking, it is generally concluded that a time series data is stationary if and only if it does not contain a unit root; that is, a time series data exhibits constant mean and constant variance over time. But there is more why an ADF test is worth running in this study. Typically, the least square regressions that include non-stationary variables would normally tend to depict the existence of a robust relationship between variables that are statistically distinguishable from zero even when such a relationship does not exist at all (Mahadeva and Robinson, 2004). In view of this, we adopt the standard test as proposed by Dickey and Fuller (1979) based on the following equations:

$$\Delta Y_t = \delta Y_{t-1} + \varepsilon_t \quad (1)$$

$$\Delta Y_t = \alpha + \delta Y_{t-1} + \varepsilon_t \quad (2)$$

$$\Delta Y_t = \alpha + \beta T + \delta Y_{t-1} + \varepsilon_t \quad (3)$$

It is very clear from three equations specified above that the first equation i.e, Equation 1 neither includes a constant nor a trend. On contrary, Equation 2 does include a constant without a trend. And lastly, Equation 3 contains both a constant and a trend. In all three equations, this study test the null hypothesis $H_0: \delta = 0$ (there is a unit root) against the alternative hypothesis $H_0: \delta \neq 0$ (unit root does not exist). If the estimated test statistic is smaller than ADF critical value, we do not reject the null hypothesis. When this happens, we conclude that the unit root exists. By contrast, if a test statistic is greater than ADF critical value, we do not reject the null hypothesis and conclude non-existence of a unit root.

3.2. Johansen Co-Integration

The existence of long-run equilibrium relationship between government revenue and expenditure in Tanzania is tested by using the standard Johansen cointegration technique. The Johansen technique goes through two stages as follows. In the first stage, we simply utilize the ADF test in order to determine the stationarity of time series data and ascertain whether both government revenue and government expenditure in Tanzania are integrated with the same order. The ADF test at this stage is very essential since econometric theory postulates that cointegration test is permitted only when government revenue and expenditure exhibit the same order of intergration. [Mulok et al. \(2011\)](#). In the second stage, we run the cointegration test for the government expenditure and revenue. However, before doing that, the optimal lag length must be selected from the vector auto-regression (VAR) model. The reason why we are doing this is that VAR estimates obtained from lag length which differ markedly from the true lag length are inconsistent, [Braun and Mittnik \(1993\)](#). Indeed, [Lütkepohl \(1993\)](#) argue forcefully that selecting a higher order length than the true lag length increases the chances for the mean-square forecast errors. Likewise, selecting the lower order lag length than the true lag length often generates auto-correlated errors. [Lütkepohl et al. \(2000\)](#) show that the cointegration test as proposed by Johansen involves two likelihood ratio tests, namely; trace statistic and the maximum eigenvalue statistic as shown in [Equations 4 and 5](#) respectively.

$$J_{trace} = -T \sum_{i=r+1}^n \log(1 - \lambda_i) \quad (4)$$

$$J_{max} = -T \log(1 - r + \lambda_i) \quad (5)$$

Where T denotes the sample size and λ_i stands for the largest canonical correlation. Essentially, the trace statistic is designed to tests the null hypothesis that there are at most r cointegrating relations against the alternative hypothesis that there exist m cointegrating vectors. On the other hand, the maximum eigenvalue statistic is designed to test the null hypothesis that there are r cointegrating relations against the alternative hypothesis of r + 1 cointegrating vectors. The null hypothesis is rejected when the trace statistic value is greater than the critical value at 5 percent significance level. The Johansen test in this study tests the null hypothesis that there is no cointegration between revenue and expenditure.

3.3. Granger Causality Test

Next, this study employs Granger causality test to determine causation between revenue and expenditure in Tanzania following the methodology proposed by [Granger \(1969\)](#). In the event where revenue and expenditure are integrated of order zero or I(0), the following standard Granger causality test equation with the lag length x will be used in our empirical strategy:

$$R_t = \delta_1 + \alpha_1 R_{t-1} + \dots + \alpha_x R_{t-x} + \beta_1 E_{t-1} + \dots + \beta_x E_{t-x} + \varepsilon_t \quad (6)$$

$$E_t = \delta_2 + \alpha_1 E_{t-1} + \dots + \alpha_x E_{t-x} + \beta_1 R_{t-1} + \dots + \beta_x R_{t-x} + \varepsilon_t \quad (7)$$

Where R_t denotes the revenue, E_t stands for expenditure, d_1 and d_2 are constants; ε_t is the error term; $\alpha_1, \dots, \alpha_x$ and β_1, \dots, β_x denote slope coefficients. it is important to note that β_1 in [Equation 6](#) is a coefficient that measure the effect of expenditure on revenue. Similarly, β_1 in [Equation 7](#) is a coefficient that measure the effect of revenue on expenditure. It follows therefore that if the estimated coefficient β_1 in [Equation 6](#) is equal to zero, then this implies that expenditure does not Granger cause revenue. Similarly, if the estimated coefficient β_1 in [Equation 7](#) is equal to zero, then revenue does not Granger cause expenditure.

A Granger causality test based on Vector Error Correction Models (VECMs) could be invoked if the cointegration relationship between expenditure and revenue exist, and that, both variables are integrated of order

one or I(1). Equations 8 and 9 below shows Granger causality test based on Vector Error Correction Models which examine causality between revenue and expenditure if the cointegration relationship between them exist:

$$\Delta R_t = \delta_1 + \alpha_1 \Delta R_{t-1} + \dots + \alpha_x \Delta R_{t-x} + \beta_1 \Delta E_{t-1} + \dots + \beta_x \Delta E_{t-x} + \gamma_1 EC_{t-1} + \varepsilon_t \tag{8}$$

$$\Delta E_t = \delta_2 + \alpha_1 \Delta E_{t-1} + \dots + \alpha_x \Delta E_{t-x} + \beta_1 \Delta R_{t-1} + \dots + \beta_x \Delta R_{t-x} + \gamma_2 EC_{t-1} + \varepsilon_t \tag{9}$$

Where Δ stands for the difference operator; EC_{t-1} denotes the one-period lagged value of the error correction term (ECM); and γ_1 and γ_2 are simply slope coefficients. The crucial advantage of using Granger causality test within the context of Vector Error Correction Model (VECM) is that both the short-run and the long-run causalities between expenditure and revenue can easily be detected (Furuoka, 2010). However, if revenue and expenditure are found to be non-stationary and do not cointegrate after being differenced, unrestricted Vector Autoregressive (VAR) model can be employed to determine the short run causality. In such cases, Granger causality determines the joint null hypothesis by using the Wald test. In this case null hypothesis that expenditure does not Granger-cause revenue in Equation 8 can be summarized as follows in Equation 10:

$$H_0: \beta_1 = \dots = \beta_x = 0 \tag{10}$$

Analogously, the null hypothesis that revenue in Equation 9 does not Granger-cause expenditure can be summarised as follows in Equation 11:

$$H_0: \beta_1 = \dots = \beta_x = 0 \tag{11}$$

In each case all lagged variables denoted by β_1, \dots, β_x are equal to zero. The existence of Granger causality implies that null hypotheses specified in 10 and 11 are strongly rejected. The null hypothesis is rejected when F-statistic is greater than the P-value. β_1 is said to be statistically significant (ability to cause) if probability value is less than 5 percent.

The relationship between revenue and expenditure in Tanzania is predicted to be premised in one of the following scenarios: First, revenue drives expenditure.. Second, expenditure drives revenue. Third, the existence of bi-directional causality between revenue and expenditure. Fourth, there is no relationship between revenue and expenditure.

3.4. Impulse Response Function

The study employs Impulse Response Function (IRF) to trace out how the changes in one variable impact on current and future values of the endogenous variables in the model. In other words, the IRF detects the impact of one time shock in one of the innovations on current and future values of the endogenous variables. A unit shock is applied to each variable (natural logarithm of Government revenue and natural logarithm of Government expenditure) and its effects observed on the VAR system based on vector auto regression moving averages as follows:

$$\Delta X_t = \sum_{j=0}^{\infty} \varphi_i \varepsilon_{t-1}, \quad i = 0, 1, 2, \dots, n$$

Where φ_i is the impact multipliers indicating the response of each variable to innovations in each of the corresponding error terms on impact, ε_{t-1} denotes innovations while n stands for number of variables in the VAR system.

3.5. Variance Decomposition

Variance decomposition is used to interpret VAR model once it is estimated, and it generally shows the amount of information each variable contributes to the other variable in the VAR model. Put it differently, variance decomposition depicts how much of the forecast error variance of each of the variables can be explained by exogenous shocks to the other variables. Consider the VAR (p) of the following specification:

$$y_t = v + A_1 y_{t-1} + \dots + A_p y_{t-p} + \mu_t$$

This can be changed to VAR (1) structure in matrix form as follows:

$$Y_t = V + AY_{t-1} + U_t \text{ where}$$

$$A = \begin{bmatrix} A_1 & A_2 & \dots & A_{p-1} & A_p \\ I_k & 0 & \dots & 0 & 0 \\ 0 & I_k & & 0 & 0 \\ \vdots & & \ddots & \vdots & \vdots \\ 0 & 0 & \dots & I_k & 0 \end{bmatrix}, Y = \begin{bmatrix} y_1 \\ \vdots \\ y_p \end{bmatrix}, V = \begin{bmatrix} v \\ 0 \\ \vdots \\ 0 \end{bmatrix} \text{ and } U_t = \begin{bmatrix} \mu_t \\ 0 \\ \vdots \\ 0 \end{bmatrix}$$

Where y_t , v and μ are k dimensional column vectors, A is kp by kp dimensional matrix and Y , V and U are kp dimensional column vectors. The mean square error of the h-step forecast of variable j :

$$MSE = [y_{j,t}(h)] = \sum_{i=0}^{h-1} \sum_{k=1}^K (e_j' \Theta_i e_k)^2 = \left(\sum_{i=0}^{h-1} \Theta_i \Theta_i' \right)_{jj} = \left(\sum_{i=0}^{h-1} \Phi_i \Sigma_u \Phi_i' \right)_{jj}$$

Where;

e_j is the j^{th} column of the I_k and subscript jj refers to that element of the matrix; $\Theta_i = \Phi_i P$, where P is a lower triangular matrix obtained by Cholesky decomposition of Σ_u such that $\Sigma_u = PP'$, where Σ_u is the covariance matrix of the error μ_t , $\Phi_i = JA^i J'$, where $J = [I_k \ 0 \ \dots \ 0]$, so that J is a k by kp dimensional matrix. The amount of forecast error variance of variable j accounted for by exogenous shock to variable k is given by $\omega_{jk,h}$,

$$\omega_{jk,h} = \sum_{i=0}^{h-1} (e_j' \Theta_i e_k)^2 / MSE[y_{j,t}(h)]$$

4. EMPIRICAL FINDINGS AND DISCUSSION

4.1. Unit Root Tests

Table 1 presents ADF results which indicate that both revenue and expenditure are non-stationary at 95 percent confidence level. That means, the null hypotheses of both variables that they have a unit root cannot be rejected. After being first differenced, the ADF results confirmed that both revenue and expenditure are integrated of order one, I (1) as shown in Table 2.

Table-1. ADF Unit root test results (Levels).

Variable	Intercept		Trend and intercept		Order of integration
	t-statistic	Critical value (5%)	t-statistic	Critical value (5%)	
Revenue	-0.384	-2.915	-2.418	-3.481	I(0)
Expenditure	-1.424	-2.915	-1.436	-3.481	I(0)

Table-2. ADF Unit root test results (First Difference).

Variable	Intercept		Trend and intercept		Order of integration
	t-statistic	Critical value (5%)	t-statistic	Critical value (5%)	
Revenue	-7.622	-2.916	-7.568	-3.482	I(1)
Expenditure	-9.169	-2.916	-9.538	-3.482	I(1)

4.2. Optimal Lag Order Selection

Next, this study computes the optimal lag order using vector auto-regression before performing the Johansen test. It is necessary to specify the lag length for a reason that the Johansen test is sensitive to lag lengths (Flambard *et al.*, 2010). As shown in Table 3 the Final Prediction Error (FPE) and the Likelihood-ratio test statistics indicate lag order 4 whereas the Hannan and Quinn Information Criterion (HQIC) and the Schwarz Bayesian Information Criterion (SBIC) indicate vector auto-regressions of lag order 2. In this regard, lag order 2 is selected for the Johansen procedure.

Table-3. Length of the Vector Auto-regressive (VAR) Model.

Lag	LL	LR	df	p	PPE	AIC	HQIC	SBIC
0	-62.44				0.022817	1.8955	1.92136	1.96078
1	127.7	380.29	4	0	0.000096	-3.57942	-3.50182	-3.38358
2	148.12	40.84	4	0	0.000059	-4.06236	-3.93303*	-3.73596*
3	150195	4.1489	4	0	0.000063	-4.00573	-3.82466	-3.54877
4	159.286	18.184*	4	0	0.000054*	-4.15548	-3.92269	-3.56797

Note: * Indicates chosen lag length.

4.3. Johansen Cointegration Test

Having proved that revenue and expenditure have the same order of integration, the study employs the Johansen test to examine the long run relationship between them. The null hypothesis for this test is that there is no cointegration between revenue and expenditure in Tanzania. The null hypothesis is rejected when the trace statistic value is greater than the critical value at 5 percent significance level. Table 4 provides Johansen test results. The results from both trace and maximum statistics clearly accept the null hypothesis that there is no cointegration between revenue and expenditure, when considering 2 lag in the underlying VAR model. This finding suggests that there is no long run relationship between revenue and expenditure in Tanzania during the period of study.

Table-4. Johansen cointegration test.

Time variable: quarterly, 2000q1 to 2017q4					
Trend: constant			Number of obs = 70		
Sample: 2000q3 - 2017q4			Lags = 2		
Maximum rank	Parms	LL	Eigenvalue	Trace statistic	5% Critical value
0	6	147.2128	.	10.4396*	15.41
1	9	151.6708	0.11959	1.5236	3.76
2	10	152.4326	0.02153		
Maximum rank	Parms	LL	Eigenvalue	Trace statistic	5% Critical value
0	6	147.2128	.	8.916	14.07
1	9	151.6708	0.11959	1.5236	3.76
2	10	152.4326	0.02153		

4.4. Unrestricted VAR Model

Since the Johansen test findings could not establish the existence of long run relationship between revenue and expenditure in Tanzania, this study will not perform VECM as envisaged before. Nonetheless, we instead employ the unrestricted VAR in order to determine the existence of short run relationship. As usual, two null hypotheses are tested. The first null hypothesis states that all revenue lagged variables do not drive expenditure. That is, all revenue lagged variables are equal to zero. Similarly, the second null hypothesis states that all expenditure lagged variables do not drive revenue. Subsequently, the null hypothesis is strongly rejected when the probability value is more than 5 percent at 5 percent significance level. Table 5 shows that expenditure does cause revenue (probability 0.1 percent), hence, we can reasonably conclude that there existed a short run causality running from lag 2 of expenditure to revenue.

Table-5. Unrestricted vector auto-regressive model test results.

Vector autoregression						
Time variable: quarterly, 2000q1 to 2017q4				No. of obs	= 70	
Sample: 2000q3 - 2017q4				AIC	= -4.069503	
Log likelihood = 152.4326				HQIC	= -3.941D913	
FPE = 0.00000586				SBIC	= -3.748289	
Det (Sigma_ml) = 000044						
Equation	Parms	RMSE	R-sq	chi2	p>chi2	
Lnrev	5	0.052965	0.9970	23316.76	0.0000	
Lnexp	5	0.135304	0.9779	3103.936	0.0000	
	Coef.	Std. Err.	Z	p> z	[95% Conf. Interval]	
Lnrev						
Lnrev						
L1.	0.7154155	0.114615	6.24	0.000	0.4907743	0.9400568
L2.	0.1855695	0.1126682	1.65	0.100	-0.0352561	0.4063951
Lnexp						
L1.	-0.0363418	0.0396031	-0.92	0.359	-0.1139625	0.0412789
L2.	0.1367339	0.0395252	3.46	0.001	0.059266	0.2142019
cons	-0.0006742	0.109138	0.01	0.995	-0.2145806	0.2132322
Lnexp						
Lnrev						
L1.	0.2619451	0.292793	0.89	0.371	-0.311919	0.8358093
L2.	-0.0444809	0.28782	-0.15	0.877	-0.6085977	0.5196359
Lnexp						
L1.	0.1354794	0.101169	1.34	0.181	-0.062809	0.3337678
L2.	0.6134219	0.1009703	6.08	0.000	0.41555238	0.8113199
cons	0.6247882	0.2788016	2.24	0.025	0.078347	1.171229

Since the estimated Unrestricted VAR model provides causality for individual lag in each variable, this study invokes Granger causality Wald test in order to jointly determine the causality for all lags in each variable.

4.5. Granger Causality Wald Test

As suggested above, we run the Granger causality Wald test in order to examine the joint null hypothesis for the causality between revenue and expenditure in Tanzania. The estimated results are presented in Table 6. Clearly, the null hypothesis that revenue does not Granger-cause expenditure is strongly accepted at the 5% level of significance. On the other hand, the null hypotheses that expenditure does not Granger-cause revenue is strongly rejected at the 5% level of significance. The test indicates that all expenditure lagged variables granger cause revenue. In other words, there was a short run unilateral causality running from expenditure to revenue during the period under study.

Table-6. Granger causality wald test.

Equation	Excluded	chi2	Df	Prob > ch2
Lnrev	Lnexp	11.97	2	0.003
Lnrev	ALL	11.97	2	0.003
Lnexp	Lnrev	3.7898	2	0.150
Lnexp	ALL	3.7898	2	0.150

4.6. Impulse Response Functions Test Results

The results of the IRF, presented in the Figure 1 depicts that one standard shock (innovation) to Government expenditure initially decreases Government revenue between period zero and period one. Beyond period one, Government revenue gradually rises to period eight and remains in the positive region. This implies that, response of Government revenue to an unexpected shock to expenditure is consistent and persistent over the time horizons. On the other hand, one standard shock to revenue temporarily increases expenditure until the third period where it reaches a steady state value up to the eighth period and remains in the positive region, meaning that revenue will have a positive impact on expenditure both in a short run and long run. Generally, the positive shock in Government expenditure imposes a powerful permanent effect on the Government revenue. This could be explained by the current budget trend in Tanzania whereby revenue collections has been increasing concurrently with the expenditure increase. In other words, concerted efforts are directed to tax administrations to increase collections as expenditure increase. This upward trend of revenue is mainly attributed to various factors such as strengthening Public and Statutory Corporations’ administration measures; the use of electronic systems by MDAs such as Electronic Fiscal Devices and strengthening Government e- Payment Gateway System.

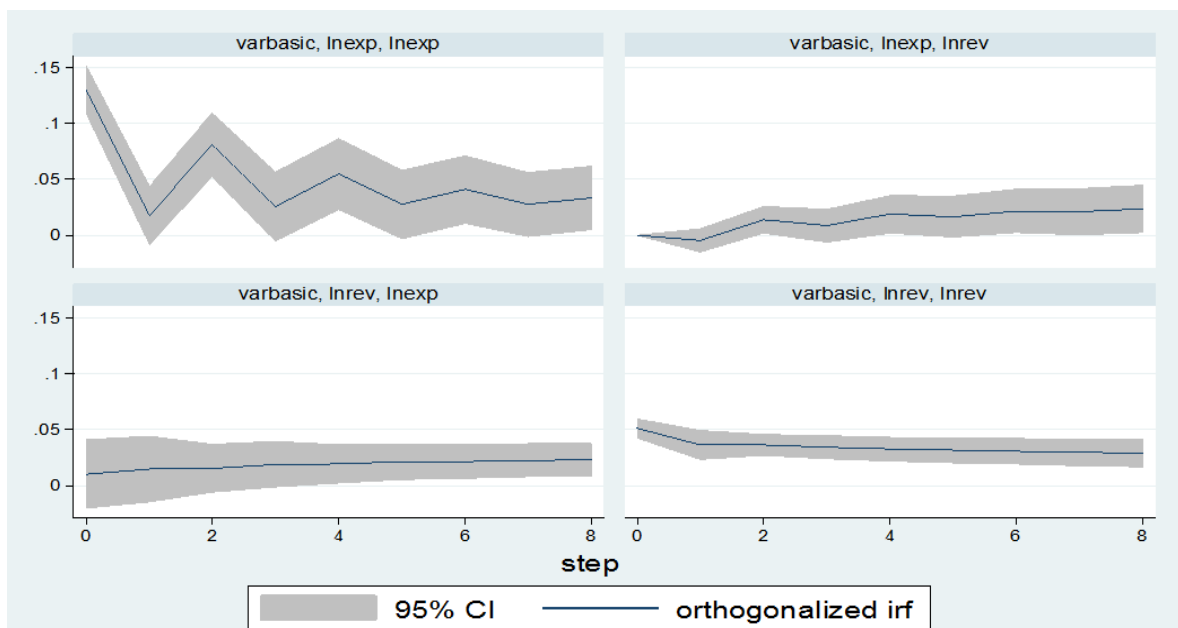


Figure-1. Impulse response functions test results.

4.7. Variance Decomposition Results

Variance decomposition is employed to measure the proportion of a 10-year forecast horizon error variance in one variable explained by a shock in it self and the other variables. Essentially, the variance decomposition informs how much of a change in a variable is caused by its own shock and how much of a change is influenced by shocks to other variables. Results on variance decomposition are presented in Table 7 which indicates that innovation to government revenue occurring in the first year accounts for 100 percent variation of fluctuation in government revenue (own shock) and has been decreasing since then for the various forecast horizons to 80.3 percent in the 10-year forecast horizon. This implies that Government expenditure did not contribute at all to the variations in

Government revenue in the first year. In other words, this implies that government revenue strongly influence itself in the short run and decreases gradually in the long run. Intuitively, this suggests that Further, variance decomposition reveals that contribution of Government expenditure in explaining the forecast error variance of Government revenue increased to 19.7 percent during the 10-year forecast period.

Table-7. Variance decomposition results.

Variance decomposition of LNREV:				Variance decomposition of LNEXP:			
Period	S.E.	LNREV	LNEXP	Period	S.E.	LNREV	LNEXP
1	0.052959	100.00000	0.000000	1	0.1352980	0.6030010	99.397000
2	0.065085	99.43323	0.566774	2	0.1373810	1.8249010	98.175100
3	0.076481	96.10772	3.892278	3	0.1617890	2.2921540	97.707850
4	0.084701	95.75874	4.241264	4	0.1651320	3.6257010	96.374300
5	0.093210	92.15636	7.843639	5	0.1757600	4.5033270	95.496670
6	0.100228	90.30984	9.690162	6	0.1794450	5.8330290	94.166970
7	0.107468	87.17052	12.82948	7	0.1857140	6.8937370	93.106260
8	0.113887	84.95108	15.04892	8	0.1893320	8.1574980	91.842500
9	0.120313	82.38694	17.61306	9	0.1938820	9.2542520	90.745750
10	0.126235	80.34021	19.65979	10	0.1973040	10.4217200	89.5782800
				Cholesky Ordering: LNREV LNEXP			

5. CONCLUSION

This paper examines causal relationship between government revenue and government expenditure by using quarterly data from 2000 to 2017 period. Johansen (1991; 1995) cointegration test suggests that there is a no long-run equilibrium relationship between government expenditure and government revenue. Further, Granger causality test based on the estimated VAR indicates government spending is unidirectional and significantly granger-cause revenue in the short run. These results suggest that tax-spend, fiscal synchronization and fiscal neutrality hypotheses are rejected in favour of the spend-and-tax hypothesis in case of Tanzania, meaning that the increase of government expenditure in Tanzania, dictates an increase of revenue in a short run. This could be explained by the current budget trend whereby revenue collections have been increasing concurrently with the expenditure increase due to the ongoing efforts of tax administration measures, including the use of electronic systems by MDAs such as Electronic Fiscal Devices and strengthening Government e- Payment Gateway System. In other words, there is a room for more revenue increase as the Government increases expenditure. This is evidenced by consistent increase of domestic revenue. However, inadequate revenue collection coupled with disproportionate increase in expenditure has continuously resulted in the fiscal deficits, which the Government has not been able to fully finance. Besides, the trend shows that inflows from the foreign sources such as grants and non-concessional borrowing have continued to decline. This calls for a wise expenditure based policies that would not jeopardise fiscal discipline. Importantly, government expenditure should be directed towards growth enhancing categories such as infrastructure, research and development, education, and health. On the other side of the coin, the revenue – expenditure disparities can be reduced by improving revenue based policies that would tap the available revenue potentials.

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