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Causal Relationship between Government Revenue Growth and Economic Growth in Ethiopia

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Abstract
The main aim of this study is to demystify the mystery surrounding the belief that, high government revenue growth rates engineered through the government multiplier process. The relationship between government revenue growth and economic growth is investigated for Ethiopia during the period 1974/75-2013/14. Theoretically and empirically it has been shown that revenue especially generated from taxes affect the allocation of resources and often distort economic growth. While, analyzing the long run and short run relationship between government revenue growth and economic growth the study applied Johansen's cointegration test, VAR, granger causality test, and VECM. Government revenue growth in general and with its component though affect economic growth found to have no causal relationship with economic growth in the long run. This implies there is fiscal independence between tax revenue and economic growth. Furthermore, in the short run the finding showed that there is independence relationship and the speed of adjustment is slow; only 27% and 7% for the components and total revenue growth with economic growth models, respectively. However, compared with post tax reform periods the latter has high speed of adjustment; meaning the speed of disturbances corrected each year in the short run become fast. Based on the findings the study highlighted some major issues that policymakers should consider for effective taxation policy formulation and implementation in line with the dynamic nature of the Ethiopian economy.
Keywords: Economic Growth, Total revenue growth, Causality.

1. Introduction

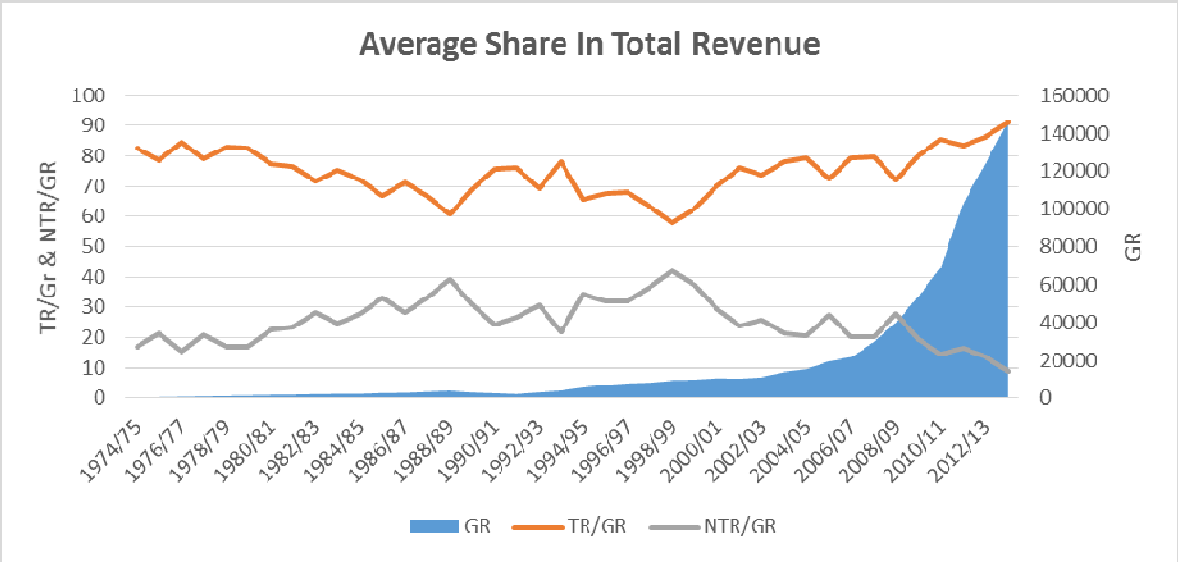
Government revenue generation process is central to development and provides governments with the funding they require to finance economic development and growth. Governments all over the world strives to create conducive environment that attract investments domestically as well as internationally. Among others, the means that helps to this kind of aspiration would be self-sufficient in tax revenue and financing whatever the economy requires by domestic means, so that managing inflationary tendencies become unforgettable task. The role of taxation in influencing economic growth is not only a main concern of the economic policy makers, tax specialists and administrators but has long been of interest to academics. In this regard, the government of Ethiopia exerts a great effort towards achieving economic prosperity in all aspects. For that matter, financing the development project by domestic means had given due attention. Hence, knowing the relationship between domestic sources and economic growth is mandatory. Since the nature of causal relationship between these two variables being unidirectional, bidirectional or independence, the main reason for conducting the study is to ensure that; wheather there is long run and short run causal relationship between the two variables, to avoid spurious regressions and also for policy making purposes where it is important to understand whether the impact is a short run or long run. To the best of my knowledge, this is the first study to investigate the causal relationship between revenue growth and economic growth in Ethiopia.

Therefore the result will provides insights into the question whether and how strong the relationship between these two variables. The rest of the paper is organized as follows: Section 2 presents the review of related literature; Section 3 describes the methodology used, while Section 4 includes discussion of the results; and finally Section 5 is the conclusion part.

The economic history of both developed and developing countries, reveals that taxation is an important weapon or instrument in the hand of government; not only to generate revenue, but also to create fiscal goals that influences the direction of investment and taming the consumption and production of certain goods and services. It is on the basis of this that Anyanwu, (1997), and Anyafo, (1996) argues that taxes are imposed to regulate the production of certain goods and services, protection of infant industries, control business and commerce, curb inflation, reduce income inequalities etc.

Ethiopia since 1974/75 never experiences fiscal surplus, if it has, can be used to finance productive expenditure, stabilize the economy, sustain debt and build up wealth. The evolution of revenue collection in Ethiopia has shown that, from the gross/total revenue collected (GR) excluding grant, tax revenue (TR) all the time is above the non-tax revenue (NTR). The share of Tax revenue to gross tax revenue during the Dergue regime were 74.99% and under the current government it showes a slight decline 74.66%, overall showing a decline at 0.33% in nominal terms at percentage point. On the other hand, the share of non-tax revenue to gross tax revenue during the Derge regime were 25% while under the current government reached at 25.46%, exhibitting 0.46% increment in nominal terms.

Figure 1. Average share in Total Revenue



Source: Own computation.

2. Literature Review

Neoclassical growth models determine the long term rate of growth of a country by the labor supply and its technical progress (Tobin, 1955; Solow, 1956). This model, therefore, does not include any reference to tax on economic growth. In addition, it is still uncertain on how tax policy can promote economic growth and stability (Herfindahl, 1957). However, tax is believed to affect a country's economic growth and should be considered in any economic growth model (Futagami et al, 1993, Barro and Sala-I-Martin, 1992). Therefore, in the endogenous growth theory the impact of tax is dependent on how other factors such as human capital are affected by the tax (Tanzi and Zee, 1997; Saint-Paul, 1992) and is included in the discussion.

However, economists have always believed that there is a connection between fiscal policies and economic growth. This connection has been thought to originate from various channels such as the negative effect of distortive tax on the performance of the economy (Tanzi and Zee, 1997).

Economic growth is one of the most important determinants of economic welfare. The global economic crisis that broke out in 2008 has reawakened interest in fiscal policy as an instrument for longer-term growth and development. The term fiscal policy has conventionally been associated with the use of government revenue, especially taxation and public expenditure to influence the level of economic activities. The implementation of fiscal policy is essentially routed through government's budget. Fiscal policy deals with government deliberate actions in spending money and levying taxes with a view to influencing macro-economic variables in a desired direction. This includes sustainable economic growth, high employment creation and low inflation. Thus, fiscal policy aims at stabilizing the economy, Increases in government spending or a reduction in taxes tend to pull the economy out of a recession; while reduced spending or increased taxes slow down a boom (Ruba, 2014).

Taxes–necessary as they are-distort private decisions, create misallocations of resources and generate dead weight losses. One might therefore conjecture that at least some of these distortions are reflected in aggregate economic performance, and that more distortive tax systems are associated with lower economic growth. Tax systems can be more or less distortive for two reasons: either because they extract more or less resources from private agents (the tax level), or because they raise a given amount of revenue in more or less distortive ways (the tax structure).

Theory predicts that all taxes, with the exception of lump-sum taxes create distortions, and such distortions could have negative consequences for growth. Similarly, tax structure varies around the globe with the prime motive of attaining maximum revenue with minimum distortion. Different countries have different philosophies about taxation and have different methods for collection; in the same manner countries have different uses of their revenue which affect the growth differently and as a result their growth rates are different. (Atkinson, 1995; Castles and Dawrick, 1990; Agell et al, 1997), all argued that the different uses of total government revenue expenditure generated by taxation affect growth differently and a similar argument applies to the way the tax revenue should be raised.

According to Harberger, (1962) and (1996), firstly, higher corporate taxes can depress investment rate, or the net growth in the capital stock, through high statutory tax rates on corporate and individual income, high effective capital gains tax rates and low depreciation allowances. Secondly, tax policy can also discourage productivity growth by reducing research and development (R and D) and economic development; if there would be any subsidy (negative tax) it will boost the research activities whose spillover effects can potentially enhance the productivity of existing labor and capital. Thirdly, taxes may reduce the work incentive which will reduce the labor force participation and hours of work, or it may also create biased occupational choice or the acquisition of education, skills and training. Fourth, heavy taxation on labor supply can distort the efficient use of human capital by discouraging worker from employment in sectors with high social productivity but a heavy tax burden and lastly tax policy can also affect the marginal productivity of capital by distorting investment from high taxed to low taxed sectors. This will hinder balanced growth and economic development.

The literature also identified three main hypotheses to explain the nexus between government tax revenue growth and government spending induced growth. One is the "tax and grow" hypothesis, which perceives a unidirectional causal relationship running from tax revenue to economic growth. The advocate of this theory was Friedman (1978), who argued that raising tax revenue either through increasing tax rates or tax base would lead to more fiscal space which will drive growth.

The second is the "grow and tax" hypothesis, which argues that increased tax revenue arises because of accelerated economic growth achieved through government spending multiplier. Peacock and Wiseman, (1979) postulates a case that government spending induced growth might increase due to crises and the increased levels of accelerated expenditure growth continue even after the crisis is over applying the Keynesian growth theory and the tax ratchet effect. They are of the view that severe crisis that initially force up government expenditure induce economic growth rate, more than tax revenue growth rate. This is capable of changing public attitudes about proper size of government. The main idea is that the original tax revenue increases due to the crisis becomes a permanent feature in the tax policies (Narayan, 2005). In an empirical sense, this hypothesis implies unidirectional causality running from economic growth to tax revenue growth.

The third is the fiscal synchronization hypothesis owing to Barro's, (1979) tax smoothing model. This hypothesis explains that government tax spending induced growth and tax revenue maximization decisions are taken simultaneously. This idea that tax revenue and real GDP change concurrently was explained by Meltzer and Richard, (1981) in their quest to explain the size of government spending viz-a-viz tax revenue collections. In an empirical sense, this hypothesis postulates bidirectional causality between economic growth and government tax revenue.

For Ethiopia, according to Yesegat, (2009), the principal domestic revenue is tax revenue and mainly that revenue is generated by indirect taxes such as Value added tax, excise and foreign trade taxes. The author stated as in the fiscal year 2003/04, indirect taxes raised about 70 per cent of the total tax revenue and the income tax along with other types of direct taxes accounted for the remaining share of only about 30 per cent of the total tax revenue of Ethiopia. It has been argued since long time that revenue from tax is the vehicle for the growth of one country's economy as it allocates the welfare among the public and privates.

The empirical literature on the tax-grow debate has yielded mixed results due in part to the various time periods analyzed, lag length specifications used, and methodology. Generally, the methodology used in these studies has been to test for Granger causality within a vector autoregressive model; however, some of the studies test for Granger causality within an error-correction framework.

For instance, Tah et al, (2011) studied the causal effects of economic growth on government tax revenue were investigated for Malaysia during the period of 1970-2009 they applied cointegration, vector error correction model (VECM) and Granger causality methodology. Empirically they showed that taxes affect the allocation of resources and often distort the economic growth. However findings of their study further clearly showed that there was a unidirectional relationship between economic growth and total government tax revenue with 21% speed of adjustment in the short run to reach equilibrium level in the long-run.

In the case of the United States, (Blackley, 1986; Ram, 1988a; Bohn, 1991; and Hoover and Sheffrin, 1992) provide evidence to support the tax-grow hypothesis while (Anderson et al, 1986; Von Furstenberg et al, 1986; Jones and Joulfaian, 1991; and Ross and Payne, 1998) find support for the grow-tax hypothesis. (Manage and Marlow, 1986; Miller and Russek, 1989; and Owoye, 1995) suggest the fiscal synchronization hypothesis was valid for the United States while, (Baghestani and McNown, 1994) support the institutional separation hypothesis.

In a study of OECD countries, Joulfaian and Mookerjee, (1991) found support for the tax-grow hypothesis in Italy and Canada; support for the grow-tax hypothesis in the United States, Japan, Germany, France, United Kingdom, Austria, Finland, and Greece; and support for the fiscal synchronization hypothesis in Ireland. Baffes and Shah, (1990) and (1994) have extended this analysis for Argentina, Brazil, Chile, Mexico, and Pakistan. It was found that for Brazil, Mexico, and Pakistan strong bi-directional causal relationship existed between tax revenues and growths, while for Argentina and Chile growth appear to cause tax revenue growth.

Delessa et al (2015) analyzed the long run relationship between direct tax and economic growth in Ethiopia for the period 1971-2013. The granger causality test shows that direct tax causality on economic growth of Ethiopia was found to be significant.

3. Data and Model specification

This study investigates the empirical relationship between government revenue growth and economic growth in Ethiopia. Yearly time series data is collected for the period 1974/75 to 2013/14 providing 40 observations. Most of the studies conducted to study the relationship of economic growth with any variables (Colombage, 2009; Koch et al, 2005; Soli et al, 2008; Karran, 1985; Hahn, 2008; Butkiewicz and Yanikkaya, 2005) used the Gross Domestic Product (GDP) as the measurement of economic growth. This study uses real GDP growth rate as a proxy of economic growth (EG) and the value of GDP (using 2010/11 as base year). Base-year analysis expresses economic measures in base-year prices to eliminate the effects of inflation. Government revenue measured as total revenue growth (i.e., including the tax and non-tax revenue growth) is used in real terms. That is change in real GDP and change in real government tax revenue is used to estimate the whole model. All data's are obtained from NBE and MoFED.

3.1 Unit Root Test

Various time series techniques can be used in order to model the dynamic relationship between time series variables (Gujarati, 2004). However, it is important to determine the characteristics of the individual series before conducting further analysis. Therefore, unit root tests for stationary will be examined on the levels and first differences for all variables using the most common unit root tests, which is the Augmented Dickey-Fuller (ADF). In this research the ADF test is employed since there are no missing gaps and significant structural breaks in the dataset.

3.2 Optimal Lag Length

As a result, another key element in a model specification process is to determine the correct lag length. Several studies in this area demonstrate the importance of selecting a correct lag length. Estimates of the model would be inefficient and inconsistence if the selected lag length is different from the true lag length (Brooks, 2004). Selecting a higher order lag length than the true one over estimates the parameter values and increases the forecasting errors and selecting a lower lag length usually underestimate the coefficients and generates autocorrelated errors. Therefore, accuracy of parameters and forecasts heavily depend on selecting the true lag length. Though, there are so many criteria used in the literature to determine the lag length of an AR process. Hence, the ability to correctly locating the true lag length depends on IC the ordinary least Squares regression model has been run starting with lag zero upwards, since according to (Engle et al, 1995) it is the mostly used and recommended methodology used to determine the lag length. Thus, lag that provides the minimum value is chosen as the optimal lag length, in other words, among the IC that provides majority lag has been chosen as optimal lag length.

3.3 Long Run Cointegration: Johansen Approach

Since the influential work of Granger and Newbold (1974) and Engle and Granger (1987) on the treatment of integrated time series data, many studies have been conducted using the co-integration methodology in order to yield consistent results and avoid the spurious regression problems, particularly in causality testing. The purpose of co-integration test in this study is to examine whether economic growth and government revenue growth share a common stochastic trend, that is, whether they move on the same wave-length in the long-run though there might be some disequilibrium in the short-run. This research will employ Johansen's (1988) approach to determine whether any combinations of the variables are co-integrated. Johansen's methodology takes its starting point in the vector autoregression (VAR) of order ρ given by:

$$Yt = \mu + A1Yt - 1 + \cdots + ApYt - p + \varepsilon t -1$$

Where Y_t is an $n \times 1$ vector of variables that are integrated of order one-commonly denoted I(1) and εt is an $n \times 1$vector of innovations. Johansen and Juselius, (1990) recommend the trace test and the maximum Eigen-value t-statistics in making the inference of the number of co-integrating vectors.

$$Jtrace = -T \sum_{i=r+1}^{n} \ln(1 - \tilde{\lambda} i) - 2$$

$$Jmax = -T \ln(1 - \tilde{\lambda} r + 1) -3$$

For trace statistic, the null hypothesis is the number of co-integrating vectors is less than or equal to co-integrating vectors (r) against an unspecified alternative. In the case of maximum Eigen-value co-integration test, the null hypothesis is the number of co-integrating vectors (r) against the alternative of 1 + r (Ng et al, 2008). If the trace statistic is greater that the Eigen-value (critical value), we conclude that the model contains at least one co-integrating equation. Where this condition is violated at a higher order, determines the maximum number of co-integrating equations. Therefore, procedures in accordance with Johansen approach is used in this study.

3.4 Short-Run Vector Error Correction Model (VECM)

According to (Engle-Granger, 1987), if two time series are co-integrated then the VECM will represent them most efficiently. If cointegration has been detected between series we know that there exists a long-term equilibrium relationship between them so we apply VECM in order to evaluate the short run properties of the cointegrated series.

A simple dynamic model of a short-run adjustment model is given by

$$Yt = \alpha 0 + \gamma 0Xt + \gamma 1Xt - 1 + \alpha 1Yt - 1 + \varepsilon t -4$$

Where, Yt is dependent variable, and $Yt - 1$ are lagged values.

Xt is independent variable, and $Xt - 1$ are lagged values.

$\alpha 0, \gamma 0, \alpha 1, \gamma 1$ are parameters.

εt is the error term assumed to be $\varepsilon t \sim iN(0, \delta^2)$.

The problems associated with the use of the short-run model are multicollinearity (this is a situation in which two or more independent variables in a multiple regression model are highly correlated) and Spurious correlation (this is a situation in which two variables have no causal connection, yet it may be inferred that they do as a result of a certain third unseen factor). The problems are solved by estimating the first difference of equation (4) to obtain, and by developing the dynamic model, obtained by re parametrization of the equation.

$$\Delta Yt = \alpha 0 + \gamma 0 \Delta Xt - 1 + \gamma 1 \Delta Xt - 1 + \alpha 1 \Delta Yt - 1 + \varepsilon t - - - - - - - - - - - - - -5$$

3.5. Causality Analysis

3.5.1. Toda-Yamamato Causality

Toda and Yamamoto (1995) proposed causality test which is robust for cointegration and stationarity properties. They levied criticism on VECM based causality test that its results may not be correct because preliminary tests biases of cointegration and first difference stationarity can be a possible source of wrong inferences regarding causality. Following system of equations is proposed to check causality inferences under Toda-Yamamoto causality test and SUR (seemingly unrelated regression) technique is utilized to estimate the model because due to SUR estimation Wald test experiences efficiency.

In order to check that growth in real tax revenue growth does not granger cause economic growth in real GDP from equation (11a), null hypothesis will be: $\delta_{1i} = 0 \; \forall_i \leq k$. If null hypothesis is rejected then we can infer that growth in tax revenue granger causes growth in real GDP. In a similar fashion all other possible causations is checked.

$$grRGDP = \alpha_1 + \sum_{i=1}^{k+dmax} \beta_{1i}\, grRGDP_{t-i} + \sum_{i=1}^{k+dmax} \delta_{1i}\, grRT_xR_{t-1} + \sum_{i=1}^{k+dmax} \lambda_{1i}\, grRNTR_{t-i} + \mu_{1t} - (6a)$$

$$grRTR = \alpha_2 + \sum_{i=1}^{k+dmax} \beta_{2i}\, grRGDP_{t-i} + \sum_{i=1}^{k+dmax} \delta_{2i}\, grRT_xR_{t-1} + \sum_{i=1}^{k+dmax} \lambda_{2i}\, grRNTR_{t-i} + \mu_{2t} - (6b)$$

$$grRNTR = \alpha_3 + \sum_{i=1}^{k+dmax} \beta_{3i}\, grRGDP_{t-i} + \sum_{i=1}^{k+dmax} \delta_{3i}\, grRT_xR_{t-1} + \sum_{i=1}^{k+dmax} \lambda_{3i}\, grRNTR_{t-i} + \mu_{3t} - (6c)$$

3.5.2. GANGER CAUSALITY-BIVARIATE MODEL

The deterministic components are selected using the Pantula principle suggested by Johansen (1992). The Pantula principle select the co-integration equation with linear deterministic trend. Lag lengths in vector auto regression is selected using likelihood ratio test. Before testing the causality of the VECM, first Granger causality test between government tax revenue (TR) which used growth in real total TR and economic growth (EG) which use growth in real GDP as proxy variable is examined to determine the long run causality in VAR context, and then short run causality has been estimated using VECM. The Granger causality test or well known as 'joint F-test' between government tax revenue growth and economic growth is used in order to check the direction of causality between two variables in Ethiopia: The Granger procedure is selected because it consists more powerful but simpler way of testing causal relationship Granger (1986). Using this test the following null and alternative hypotheses are estimated.

In testing long-run causality, three hypothesis is tested using VAR. The first one is based on the "*Grow and Tax*" hypothesis advocated by (Peacock and Wiseman, 1978). They postulate a case that government spending induced growth continue even after the crises is over applying the Keynesian growth theory and the tax ratchet effect. They are of the view that severe crises that initially force up government expenditure induce economic growth rate, more than tax revenue growth rate. Generally, they argue that increased tax revenue arises because of accelerated economic growth achieved through government spending multiplier.

$$grRTRt = \sum_{i=1}^{n} \alpha i\, grRTRt - i + \sum_{j=1}^{n} \beta j\, grRGDPt - j + \phi\gamma t - 1 + \mu t - - - - - - (7)$$

Equation (7) postulates that growth in real tax revenue is related to past values of itself as well as that of growth in RGDP and a certain proportion of equilibrating error.

The null and alternate hypotheses in this case are;

H_0: Economic growth doesn't granger cause total revenue growth.

H_A: Economic growth granger cause total revenue growth.

The other one is based on the "*Tax and grow*" hypothesis advocated by Friedman (1978). He argued that raising tax revenue either through increasing tax rate or tax base would lead to more fiscal space which will drive growth. In this case the VAR has the following form;

$$grRGDPt = \sum_{i=1}^{n} \lambda i\, grRTRt - i + \sum_{j=1}^{n} \delta j\, grRGDPt - j + \theta\gamma t - 1 + st - - - - - - (8)$$

Equation (8) postulates that growth in RGDP is related to past values of itself as well as that of growth in real tax revenue and a certain proportion of equilibrating error.

The null and alternate hypotheses in this case are;

H_0: Total revenue growth doesn't granger cause economic growth.

H_A: Total revenue growth granger cause economic growth.

The final hypothesis tested in this study is the "*Fiscal synchronization*" hypothesis asserted with Barro's (1979), tax smoothing model holds. This hypothesis explains that government tax spending induced growth and tax revenue maximization decisions are taken simultaneously. This idea, that tax revenue and real GDP change concurrently was explained more by (Meltzer and Richard, 1981), in their quest to explain the size of government spending vis-à-vis tax revenue collections. In an empirical sense, this hypothesis postulates 'bidirectional' causality between economic growth and government tax revenue.

Otherwise, independence will happen. This is to mean that tax revenue growth and economic growth decisions are taken independently.

The short-run causality between tax revenue growth and economic growth is examined using the difference of the variables in equation (7) and (8). Therefore, the above models are estimated in anticipation of yielding four distinct cases.

I. Unidirectional causality from **grRTR to grRGDP** is indicated if the estimated coefficients on the lagged **grRTR** in equation (7) are statistically different from zero as a group (i.e., $\alpha i \neq 0$) and the set of estimated coefficients on the lagged **grRGDF** in (8) is not statistically different from zero (i.e., $\delta j = 0$).

II. Conversely, unidirectional causality from **grRGDP to grRTR** exist if the set of lagged **grRTR** coefficient in

(7) is not statistically different from zero (i.e., $\alpha i = 0$) and the set of the lagged $grRGDF$ coefficients in (8) is statistically different from zero (i.e., $\delta j \neq 0$).

III. Feedback, or bilateral causality is suggested when the set of $grRTR$ and $grRGDF$ coefficients are statistically significantly different from zero in both regressions.

IV. Finally, independence is suggested when the set of $grRTR$ and $grRGDP$ coefficients are not statistically significant in both cases.

There has been much criticism of Granger causality testing in the econometrics literature. Roberts and Nord (1985) found that the functional form of the time series affected the sensitivity of both Granger's and Sims' tests. Data that had undergone logarithmic transformation showed no sign of causality while the untransformed data yielded significant results. This stands to reason, as logarithmic transformation tends to reduce heteroskedasticity and increase the stationarity of the variables.

However Chowdhury (1987) found more disturbing results that give support to those who have doubted whether Granger causality was related to philosophical causality or economic exogeneity in any meaningful way. He found that a Granger test indicated that gross national product caused sunspots! A Sims test showed that prices caused sunspots! None of the alternative hypotheses were validated. Prices and income may be exogenous in the sunspot equations, but sunspots are not endogenous in any meaningful philosophical or economic way. But because sunspots are quite predictable prices and income might have anticipated them. The forward-looking behavior of human agents can be an obstacle to Granger causality testing.

4. Estimation Results

4.1 Unit Root Test

The ADF test for unit root of the variables are conducted at level. Table 1 shows unit root test of variables at level. As a result, we can overwhelmingly reject the null hypothesis of a unit root test at all level of significance and the model can be accepted since the coefficient of variables in all cases are negative. Since, all the variables are integrated of order one at level, i.e., I (1), we can proceed with the Johansen test of cointegration to determine wheather there exist long term relationship of variables in the Trivariate and bivariate system of models.

The ADF test for unit root of the variables are conducted at level. Table 4.1 shows unit root test of variables at growth form.

Table 4.1. Unit root test of variables at Growth form.

Variables	Augmented Dickey Fuller test								Decision
	Constant only				Constant and Trend				
	Test statistics	1% c.v	5% c.v	10% c.v	Test statistics	1% c.v	5% c.v	10% c.v	
grRGDP	4.305	3.615	2.941	2.609	6.156	4.226	3.536	3.200	I(1)
grRTR	4.956	3.615	2.941	2.609	4.909	4.219	3.533	3.198	I(1)
$grRT_xR$	4.314	3.615	2.941	2.609	5.394	4.219	3.533	3.198	I(1)
grRNTR	7.319	3.615	2.941	2.609	7.404	4.219	3.533	3.198	I(1)

Source: own computation using NBE data.

4.2 Optimal Lag Length

While, checking up to four lag order to include the 5% significance level suggest that lag 3 would be the correct lag length. This has been confirmed by LR, FPE, and AIC in both cases. Thus, it can be taken to estimate johansen test of cointegration, VAR and VECM models.

Table 4.2A. Lag length Selection for Trivariate Model

VAR Lag Order Selection Criteria
Endogenous variables: GRRGDP $GRRT_xR$ GRRNTR
Sample: 1 40
Included observations: 35

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-418.9872	NA	5956361.	24.11355	24.24687*	24.15958*
1	-411.5745	13.13104	6541233.	24.20426	24.73752	24.38834
2	-408.1640	5.456783	9124039.	24.52366	25.45687	24.84580
3	-388.3963	28.23965*	5095160.*	23.90836*	25.24151	24.36856
4	-385.2111	4.004228	7563972.	24.24063	25.97374	24.83890

Table 4.2B. Lag length Selection for Bivariate Model

VAR Lag Order Selection Criteria
Endogenous variables: GRRGDP GRRTR
Sample: 1 40
Included observations: 35

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-248.8558	NA	5761.147	14.33461	14.42349*	14.36530*
1	-246.4114	4.469702	6301.843	14.42351	14.69014	14.51555
2	-245.9810	0.737873	7751.683	14.62748	15.07187	14.78089
3	-236.4042	15.32283*	5675.917*	14.30881*	14.93095	14.52357
4	-233.5709	4.209478	6144.671	14.37548	15.17537	14.65160

Source: EViews version 6 using NBE data
Note: * indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

4.3 Johansen Test Result for Long Run Cointegration

Table 4.3A and 4.3B, shows the summary of Johansen co-integration test results where both trace and maximum eigenvalue statistics find that one co-integrating vector exists between government revenue growth and economic growth. Therefore, we conclude that there is co-integrating vector between both variables, where both tests rejects the null hypothesis of no co-integration with one co-integrating vector.

Table 4.3A and 4.3B. Johansen Test of Cointegration

4.3A. For Trivariate Model				
H_0	$\lambda\ Trace$	CV (5%)	$\lambda\ Max-eigen$	CV (5%)
r= 0	43.627	42.915	21.011	25.823
r= 1	22.615	25.872	11.911	19.387
4.3B. For Bivariate Model				
r=0	28.266	25.872	20.070	19.387
r= 1	8.196	12.517	8.196	12.517

Source: Own computation using EViews version 6 NBE data

4.4 Short Run Vector Error Correction Model

4.4.1. Trivariate Model

Since the series are co-integrated, the short run equation of the series can be determine using VECM. The VECM equation is as follows given the diagnostic test for stability results:

$$grRGDP = 0.332 - 0.274grRGDP_{t-1} + 1.013grRT_xR_{t-1} + 0.112grRNTR_{t-1}$$

Where, ECT_{t-1} is represented by the coefficient of $grRGDP_{t-1}$

The speed of adjustment or the error correction term (ECT) in the trivariate setting is come up with the expected sign and level of significance. In an empirical sense, it implies 27% of the disturbance in the short run is corrected each year or it adjust any disequilibrium towards long run equilibrium state.

4.4.2. Bivariate Model

$$grRGDP = 0.521 - 0.069grRGDP_{t-1} + 3.753grRTR_{t-1}$$

Where, ECT_{t-1} is represented by the coefficient of $grRGDP_{t-1}$

The speed of adjustment or the error correction term in the bivariate setting is come up with the expected sign and level of significance. In an empirical sense, it implies 7% of the disturbance in the short run is corrected each year or it adjust any disequilibrium towards long run equilibrium state. The slow speed of adjustment could be related to the revenue generation within the economy has been bedeviled by the narrow base of the economy, low-income levels, dominance of the primary sector, low monetization and urbanization. These constrained the federal government from generating and increasing its revenue from taxes.

All stability test conducted through VECM did not indicates any chronic indications, therefore the estimated VECM was statistically in a stable mode.

Likewise, the trivariate and bivariate system diagnostic test of residuals is examined and it shows that the model has desirable properties of OLS. Residual test of normality, serial correlation LM test and heteroskedasticity test is conducted. The result of heteroskedasticity test of the residuals also does not show evidence for autoregressive conditional heteroskedastic errors. This indeed is not surprising, since heteroskedasticity is not much problem in time series (Green14, 1997), the result is presented as follows for the trivariate and bivariate models respectively.

$x^2 Normality = 0.914$ $x^2\ Serial = 0.277$ $x^2 Hetrosckedasticity = 0.016$, and
$x^2 Normality = 0.879$ $x^2\ Serial = 0.157$ $x^2 Hetrosckedasticity = 0.014$

4.5 Causality Test

4.5.1. Long run causality for Trivariate Model (VAR)

Examining pairwise granger causality test is important for the trivariate system in order to infer the direction of causation between three variables. The following table shows Granger causality test for components of government revenue and economic growth model in the long run.

Table 4.5A. Pairwise Granger Causality Test for Trivariate Model

Pairwise Granger Causality Tests
Sample: 1 40
Lags: 3

Null Hypothesis:	Obs	F-Statistic	Prob.
$GRRT_xR$ does not Granger Cause GRRGDP	36	0.03575	0.9908
GRRGDP does not Granger Cause $GRRT_xR$		2.01128	0.1343
GRRNTR does not Granger Cause GRRGDP	36	1.53550	0.2263
GRRGDP does not Granger Cause GRRNTR		1.03833	0.3903
GRRNTR does not Granger Cause $GRRT_xR$	36	4.12221	0.0150*
$GRRT_xR$ does not Granger Cause GRRNTR		2.64244	0.0680**

Source: EViews version 6 using NBE data
*Note: * and ** indicates statistical significance at 5% and 10%*

The result from the above table reveals that, the null hypothesis can't be rejected in all cases except for growth in non-tax revenue and tax revenue, i.e., growth in real non-tax revenue does cause growth in real tax revenue and growth in real tax revenue does cause growth in real non-tax revenue under the trivariate system in Ethiopia for the period under investigation. Therefore, there is only long run causal relationship between components of tax revenue growth, not with economic growth. Hence, no justification found in this study to support the finding by Delessa et al (2015) whom they found that direct tax granger cause economic growth.

4.5.2. Long run causality for Bivariate Model (VAR)

Only if the analysis of bivariate system make sense when granger causality test is examined for the bivariate system in order to infer the direction of causation between two variables. The following table shows Granger causality test for total tax revenue and economic growth in Ethiopia.

Table 4.5B. Pairwise Granger Causality Test for Bivariate Model

Pairwise Granger Causality Tests

Sample: 1 40

Lags: 3

Null Hypothesis:	Obs	F-Statistic	Prob.
GRRTR does not Granger Cause GRRGDP	36	0.61415	0.6114
GRRGDP does not Granger Cause GRRTR		0.81930	0.4938

Source: EViews version 6 using NBE data

The result from Table 4.5B shows that there is no causality between total tax revenue growth and economic growth in Ethiopia. In an empirical sense the null cannot be rejected since the p-values are not significant i.e., greater than 0.05 level. Therefore in the long run the granger causality test between total revenue growth and economic growth suggest independence, meaning the set of growth in real total revenue and growth in real GDP coefficients are not statistically significant in both cases.

It can be explained as, in Ethiopia for the period under investigation growth decisions has been made in isolation with revenue/taxation. Therefore, in the long run for Ethiopia neither the "*Tax-Grow*", "*Grow-Tax*" nor the "*fiscal synchronization*" hypothesis holds. It implies that growth decisions are made in isolation from growth in government tax revenue. This, could be accounted among others the reason for the dampening budgets deficit due to misallocation of tax revenue to recurrent expenditure.

The result is consistent with the findings in United States and Zimbabwe. According to, Baghestani and McNown (1994) the finding in US support the institutional separation hypothesis. Also for Zimbabwe independence was found by Dzingirai and Tambudazai (2014). Therefore, the strong or weak growth performance does not boost or hamper the revenue collection, since there was no causal relationship between revenue and growth in Ethiopia for the period 1974/75-2013/14.

4.5.3. Short run Causality for Trivariate Model

Only if, the error correction term has negative sign and got statistical significance that we can test the short run causality between components of tax revenue and economic growth. To examine the short run causality we use the technique of Wald coefficient restriction. Table 5.8B shows the result of the tests.

Table 4.5C. Joint F-Test for Trivariate Model

Wald-coefficient restriction	Year effect	Prob (chi2)
C(5)=c(6)=0	1 and 2	0.3132
C(6)=c(7)=0	2 and 3	0.3628
C(8)=c(9)=0	1 and 2	0.2265
C(9)=c(10)=0	2 and 3	0.2637

Source: own computation, EViews version 6 using NBE data

The result of Table 4.5C shows wheather independent variables jointly has short run causality or not. Meanwhile, the null can't be rejected at 0.05 level; meaning there is no short run causality running from the components of tax revenue to real GDP growth in the short run.

4.5.4. Short run Causality for Bivariate Model

Again only if, the error correction term has negative sign and got statistical significance that we can test the short run causality between growth in total tax revenue growth and economic growth. To examine the short run causality we use the Wald coefficient technique. Table 5.8B shows the result of the tests.

The result of Table 4.5C shows wheather independent variables jointly has short run causality or not. Meanwhile, the null can't be rejected at 0.05 level; meaning there is no short run causality running from the total revenue to real GDP growth in the short run for Ethiopia.

Table 4.5C. Joint F-Test for Bivariate Model

Wald-coefficient restriction	Year effect	Prob (chi2)
C(5)=c(6)=0	1 and 2	0.1224
C(6)=c(7)=0	2 and 3	0.1402

Source: own computation, EViews version 6 using NBE data.

5. Conclusion

This research attempts to determine the causal relationship between government revenue growth and economic growth. To capture this, time series macroeconomic data were culled from 1974/75-2013/14. In fact it was worthwhile to conduct an empirical test to observe the time related nature of the relationship between revenue growth excluding grant and growth in order to see the direction of movement of the so called two potent components of government fiscal policy. The

determination of the causal ordering between these two macroeconomic aggregates is crucial to ensure a sharpening of tax policy and the effectiveness of fund management for expenditure (Taha and Loganathan, 2008) and poverty eradication.

The econometric analysis, using Johansen test of co-integration affirmed that a long run relationship exists between the explanatory and explained variable both in trivariate and bivariate system.

The granger causality test reveals causal relationship exists only between growth in tax and non-tax revenue growth not, with economic growth in real terms. Hence, there is only long run bi-directional causal relationship exist in components of government revenue. In addition, looking at the causal relationship between government revenue growth and economic growth the result affirms, there is no causal relationship between government total revenue growth and economic growth for the period 1974/75-2014/15 in Ethiopia. Besides, the model ability in maintained hypothesis that the coefficients of the model are stable over a sample interval is verified.

Based on the analysis, unlike other studies (Karran, 1985, Poulson and Kaplan, 2008) the results showed that changes in taxation do not have any impact on economic growth and vice-versa. Therefore a result of this study does not support the supply-side hypothesis which emphasizes the effect of tax towards economic growth in favor of Baro's theoretical assertion that changes in government revenue-tax revenue does not change the long term growth trajectory, that is, the economy will be in a

Steady-state. In addition, the strong or weak growth performance does not boost or hamper the tax revenue collection, since there was no causal relationship between tax revenue and growth in Ethiopia for the period 1974/75-2013/14. The results have shown that government of Ethiopia is not efficiently utilizing the tax revenue to enhance societal welfare that is there is no redistribution of income to restore equity principle of a tax system. Based on these findings the research has forwarded the following recommendations;

- The long run and short run result do not provide strong evidence that government revenue growth has been beneficial for economic growth in Ethiopia, but this may be because of the narrow tax base. Thus in order to generate the revenue the economy requires government should increase its revenue either by increasing tax base or tax rate and mobilize the resources to growth enhancing sectors.
- The causal analysis in the long run and short run tells independence in Ethiopia. Thus, policymakers should be pro-growth or must direct tax revenue collection towards infrastructure development which will attract private investment and then through the multiplier process will drive growth with a large margin. On the other hand, the result reveals government is not using taxation as fiscal instrument for equitable redistribution and efficient allocation purpose. A policy shift is expected from the government side to induce the responsiveness between tax revenue and economic growth.
- The long run and short run result do not provide strong evidence that government revenue growth has been beneficial for economic growth in Ethiopia, but this may be because of the narrow tax base. Thus in order to generate the revenue the economy requires government should increase its revenue either by increasing tax base or tax rate and mobilize the resources to growth enhancing sectors.
- There are several ways to extend this paper. Since the impact of fiscal policy on economic growth is unmitigated debate, it could be possible to extend the debate for Ethiopia by examining the correlation fiscal policy (i.e., distortionary revenues, non-distortionary revenues and other revenues) with economic growth, average tax rate and economic growth, and by inculcating control variables to tax revenue (i.e., inflation, population and trade openness) with economic growth.

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