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The impact of tax revenue on economic growth: time series evidence from Ethiopia

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Abstract

Tax revenue is believed to provide developing countries with a stable and predictable fiscal environment to promote growth and to finance their social and physical infrastructural needs. However, the prior empirical results across different countries witness that the relationship between government tax revenue and economic growth can be negative, positive or neutral depending on countries economic exposure and stabilization policy experiences. Thus, this study examined the effect of tax revenue on economic growth of Ethiopia, from 1980 to 2018 by employing Autoregressive Distributed Lag (ARDL) approach. The enquiry also used Vector Error Correction Model (VECM) in order to observe how fast the co-integrated variables convergence in long-run and found expected negative sign. The stationarity properties of the data were detected using ADF and PP test statistics and the result confirms all the variables are stationary at level and first difference evidencing the effectiveness of ARDL model. The ARDL bound test result indicates that there is long run relationship between RGDP and independent variables. The empirical results are indication of long- and short-run positive impacts of government tax revenue on economic growth in Ethiopia. The result suggests that tax revenue exerted a positive and statistically significant effect on economic growth both in the long run and short-run implying that tax revenue enhances economic growth in Ethiopia. Furthermore, government expenditures on education and health as proxy of human capital and rate of inflation variables show a statistically significant and expected effect on real GDP in Ethiopia. Hence, the policy maker needs to give more effort to expand the tax base and should increase the efficiency of collection to stimulate overall economic growth in long and short run.

JEL code: H2; O4; C22

Keywords: Tax revenue, Economic Growth, Co-integration, ARDL, Ethiopia

Introduction

Fiscal policy is an important economic tool by which the government of any country influences economic activities. It comprises government revenue and expenditure, which provide crucial worth in promoting price stability and sustainable growth in output, income and employment creation (Ahmed, 2010). Government revenue is an important instrument of the fiscal policy as it facilitates government spending (OECD, 2008). Public revenue consists of taxes and non-tax revenue (Illyas and Siddiqi, 2010). Non-tax revenue refers to the revenue obtained by the government from sources other than tax. Tax revenue provides developing countries like Ethiopia with a stable and predictable fiscal environment to promote growth and to finance their social and physical infrastructural needs (Dzingirai and Tambudzai, 2014). According to Romer and Romer (2010), tax revenue enables low income countries to reduce long term reliance on aid and it also ensures good governance by promoting the accountability of governments to their citizens. Availability and mobilization of revenue is the influential factor with which an economy is managed and run (Ilyas and Siddiqi, 2008). In many instances, tax revenue is one of the most significant factors that contribute to a country's growth (Myles, 2000).

The Solow Growth Model concluded that tax revenue does not affect the steady-state growth rate nor impact on long term economic growth rates (Solow, 1956). On the other hand, Friedman (1978) postulated that raising tax revenue either through increasing tax rates or broadening the tax base would lead to more fiscal space which will drive growth. Similarly, the "grow and tax" hypothesis states that increased tax revenue arises because of accelerated economic growth achieved through government spending multiplier (Narayan, 2005; Peacock and Wiseman, 1979). Moreover, the "fiscal synchronization" hypothesis explains that government tax spending induced growth and tax revenue maximization decisions are taken simultaneously (Meltzer and Richard, 1981; Barro, 1979). This hypothesis postulates bi-directional causality between economic growth and government tax revenue.

Empirical results across different countries about the relation between tax revenue and economic growth implthat there is no clear-cut conclusion on the direction of effect. A number of studies have shown the positive link between tax and economic growth (Mashkoor et al., 2010; Ioan and Constanti, 2010). On the other hand, the analyses by Padovano and Galli (2001) revealed negative effects of marginal income tax rates on economic growth. Moreover, Poulson and Kaplan (2008) emphasized that income taxes, customs and excise duties inversely affect economic growth, while expenditures directly financed by taxation have positive effects (Myles, 2000). On the other hand, Worlu and Nkoro (2010) forwarded the long-run independence of tax revenue and economic growth. These contrary results show that the effect of tax revenue on economic growth depends on countries' exposure to economic problems and in their stabilization policy experiences. Hence, it is imperative to investigate the link between tax revenue and economic growth.

Only a few studies have been conducted on the relationship between government tax revenue and economic growth in the Ethiopian context. According to Biruk (2016), there was short and long-run fiscal independence between tax revenue and economic growth in Ethiopia. However, most of empirical experiences in other low-income countries show that there is positive and strong long-run and short-run relation between tax revenue and economic growth. Wisdom (2014) found a positive and statistically significant effect of tax revenue on economic growth both in the long run and short-run in Ghana. Furthermore Koch et al (2005) identified a positive relation between government tax revenue and economic growth in South Africa. The analysis by Abdulkadir et al (2018) also displayed that, tax revenue has a positive significant effect on economic growth in Kenya. Furthermore, the prior research included only tax revenue and non-tax revenue as independent variables. However, in reality GDP does not only rely on tax and non-tax revenue rather there are various variables which must be included in growth model. Hence, this study includes these important variables such as gross capital formation as proxy for gross investment, government expenditure on education and health facility as proxy for human capital, total labor force in economy and rate of inflation which are excluded in prior studies. Thus, this study fills the gap in the current literature, particularly related to research gap in Ethiopia.

Most of the prior research has applied Ordinary Least Squares, Engle-Granger and conventional Johansson co-integration methods to verify the long run and short run link between revenue and economic growth. Autoregressive Distributive Lag (ARDL) model has relatively suitable advantage over the above -mentioned methods. Hence, this study aimed to investigate the short-run and long-run relation between tax revenue and economic growth, particular in Ethiopia using time series data spanning from 1980 to 2018 through employing ARDL approach.

Data and model specification

Source of data and variables

This enquiry was conducted using time series annual data collected for the period 1980 to 2018 providing 39 observations. The main sources of data were World Bank economic indicators and IMF world economic outlook database. The data for real GDP; working age population (LF); expenditure on health and education (EXHED) and rate of inflation (INF) were collected from World Bank economic indicators reported by https://www.focus-economics.com/ in January 2020. Data for tax revenue (TAXR) and gross capital formation (GINV) obtained from IMF world economic outlook database posted in October 2019 (World Bank, 2020).

Most of previous studies used Gross Domestic Product (GDP) changes as measure of economic growth (Colombage, 2009; Koch et al., 2005; Hahn, 2008 and Butkiewicz and Yanikkaya (2005). Hence, this study also tends to use real GDP calculated as total output to base year price 2010. Government tax revenue measured as total tax revenue which is composed of collections from direct and indirect tax revenues. Further, the government expenditure on education and health as percentage of GDP used as proxy of human capital, gross capital formation as proxy of gross investment, number of active population aged 15 to 64 as labor force and rate of inflation were served as explanatory variables in this investigation.

Model specification

This study applied augmented Solow growth model to analyze the link between government tax revenue and economic growth, in which real economic growth is a function of tax revenue, human capital, gross investment, labor force and rate of inflation (Solow, 1956). Following Fosu and Magnus (2006); Sakyi (2011) and Mansouri (2005) the functional form of the model to be used in this study is the cobb-Douglas production function framework. It can be specified as:

$$Y_t = A_t K_t^{\alpha} L_t^{\delta} \qquad (1)$$

Since the aim of this study was to examine the relationship between tax revenue and economic growth, the model for this study was specified as follows with some modification:

$$RGDP = f(LF_t, TAXR_t, GINV_t, EXHED_t, INF_t) \qquad (2)$$

Hence, this can be set as:

$$RGDP_t = \mu K_t^{\alpha} LF_t^{B_1} TAXR_t^{\beta_2} GINV_t^{\beta_3} EXHED_t^{\beta_4} INF_t^{\beta_5} \tau^{\varepsilon_t} \qquad (3)$$

Where K_t is capital stock and LF_t is labor force or active population; RGDP refers to real economic growth, $TAXR_t$ is total tax revenue, $GINV_t$ gross investment, INF_t is rate of inflation and $EXHED_t$ is the government expenditure on health and education as a proxy of human capital.

Equation (3) is transformed into its natural logarithmic form for tractability as in equation (4) below:

$$\ln(RGDP) = B_o + B_1 \ln(\text{LFt}) + B_2 \ln(TAXR_t) + B_3\ln(GINV_t) + B_4 \ln(EXHED_t) + B_5 \ln(INF_t) + \varepsilon_t \text{-----} (4)$$

Unit Root Analyses

Before analyzing the dynamic relationship between time series variables using any available model, it is important to determine the characteristics of the individual series (Gujarati, 2004). Hence, unit root tests for stationarity are examined on the levels and first differences for all variables using the Augmented Dickey-Fuller (ADF) and the Philips-Perron tests (PP) (Pesaran et al., 2001). ADF yields superior results than PP test if the data set has no missing observations and no structural breaks while PP test yields superior results if a series has some missing observations and have structural breaks (Greene, 2003). In this enquiry, both ADF and PP test were employed to check the stationarity of variables included in model.

The Autoregressive Distributed Lag Model (ARDL)

Prior researches used the Johansen (1988) co-integration and Engle-Granger causality technique to determine the long-term relationships between time variant variables. However, a series of studies by Nayaran (2004) and Pesaran et al. (2001) introduced an alternative co-integration technique known as the Autoregressive Distributed Lag (ARDL) bound test. There are numbers of advantages of using ARDL model, also called ‘Bound Testing Approach,’ over conventional Engle-Granger two-step procedure (Johansen and Jtiselius, 1990).

The ARDL model is a good approach to determine the co-integration relation in small samples, while Johansen co-integration techniques require large data samples for valid estimation of the parameters (Nayaran, 2004; Pesaran et al., 2001). This means that the model avoids the problem of biases that arise from small sample size.

On the other hand, Pesaran and Shin (1999) retain that modeling ARDL with the appropriate number of lags will address auto-correlation and endogeneity problems, because it is possible that different variables have different optimal numbers of lags, whereas in Johansen-type models this is not possible rather take the same lag length for all variables. Furthermore, the ARDL estimation can be applied whether the repressors' are purely order zero [I (0)], purely order one [I (1)], or a mixture of both while other cointegration techniques require all of the repressors to be integrated of the same order. As a result, this approach has become popular and suitable for analyzing the long-run relationship and extensively applied in empirical researches in recent years. Due to aforementioned relative relevance, this study employed ARDL approach.

The ARDL model representation of equation (4) can be specified as:

$$\begin{aligned}\triangle \ln(RGDP_t) &= B_o + B_1 \ln(RGDP_{t-1}) + B_2 \ln(TAXR_{t-1}) + B_3 \ln(LF_{t-1}) + B_4 \ln(GINV_{t-1}) \\ &+ B_5 \ln(EXHED_{t-1}) + B_6 \ln(INF_{t-1}) + \sum_{i=1}^{q} \alpha_i \triangle ln(RGDP_{t-i}) \\ &+ \sum_{j=1}^{r} \alpha_j \triangle \ln\left(TAXR_{t-j}\right) + \sum_{k=1}^{s} \alpha_k \triangle \ln(LF_{t-k}) + \sum_{l=1}^{v} \alpha_l \triangle \ln(GINV_{t-l}) \\ &+ \sum_{m=1}^{y} \alpha_m \triangle \ln(EXHED_{t-m}) + \sum_{n=1}^{z} \alpha_n \triangle \ln(INF_{t-n}) + \varepsilon_t \qquad ----(5)\end{aligned}$$

Where: the symbol Δ is the first difference operator, q, r, s, v, y and z are the lag length with their respective variables and ε_t error term which is assumed to be serially uncorrelated; $\beta_{1,2}$,β_3,β_4, β_5 and β_6 indicate coefficients that measure long-run elasticities; α_i, α_j, α_k, α_l, α_m and α_n indicates coefficients that measure short-run elasticities among the variables. Based on economic theory, the hypothesized signs of the coefficients are $\beta_2 > 0, \beta_3 > 0, \beta_4 > 0, \beta_5 > 0, \beta_6 < 0$.

The first step involved in ARDL model is to test the null hypothesis of no cointegration which is defined as $H_{O:}$ $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = 0$ against the alternative hypothesis of $H_{1:}$ β_1, β_2, β_3, β_4, β_5, $\beta_6 \neq 0$ of the existence of co integrating relationship between the variables. When the calculated F-statistic is greater than the upper critical bound, the null hypothesis will be rejected suggesting that there is presence of long-run relationships among the variables while if the F-statistics falls below the lower critical bound value, it implies that there is no long-run relationship. However, when the F-statistic lies within the lower and upper bounds, then we can have no decision made up on co-integration. In this case, unit root tests should be conducted to assure the order of integration of the variables (Pesaran et al., 2001). This is due to the fact that ARDL bound testing is inapplicable when the variables are integrated of order 2 or higher.

Having, the cointegration of the series, the short-run elasticities can also be derived through constructing the error correction model in the following form:

$$\triangle \ln(RGDP_t) = \alpha_o + \sum_{i=1}^{q} \delta_i \triangle ln(RGDP_{t-i}) + \sum_{j=1}^{r} \delta_j \triangle \ln\left(TAXR_{t-j}\right) + \sum_{k=1}^{s} \delta_k \triangle \ln(LF_{t-k}) + \sum_{l=1}^{v} \delta_l \triangle \ln(GINV_{t-l}) + \sum_{m=1}^{y} \delta_m \triangle \ln(EXHED_{t-m}) + \sum_{n=1}^{z} \delta_n \triangle \ln(INF_{t-n}) + \rho ECM_{t-1} + \varphi_t - - - - - - - - - - - - - - - - - -(6)$$

Where, the variable ECM_{t-1} is the error correction term which captures the long- run relationship whereas $\delta's$ are the coefficients associated with short-run dynamics of the model coverage to equilibrium.

Results and Discussion

Descriptive statistics

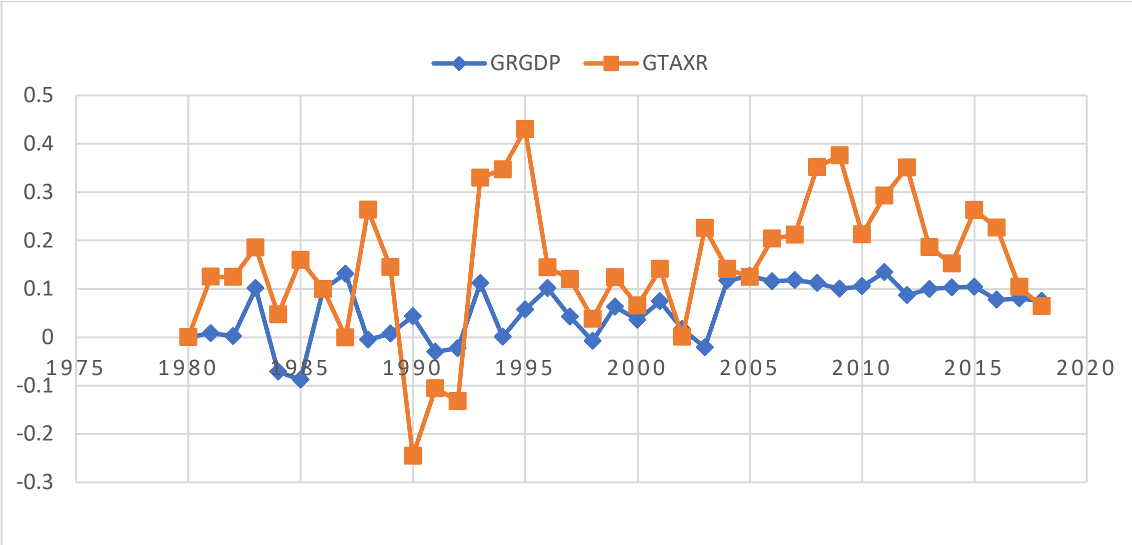
The summary statistics for study variables, these are real GDP; tax revenue (TAXR); gross capital formation (GINV); working age population (LF); expenditure on health and education (EXHED) and rate of inflation (INF). The important descriptive character portrayed includes the mean, maximum value, minimum value and standard deviation (table-1). The first column shows the variables and second column shows the mean or average values of all the variables. Accordingly, the mean value of real GDP is 280,053.10 million US dollar; mean value of tax revenue and gross investment are 48.57 million and 108,796.50 US dollar respectively. On the other hand, the average rate of inflation in the study period is 8.97% and the mean government expenditure on health and education in share of GDP is 4.30%. The average number of active population was estimated to be 34.49 million and its minimum and maximum number were 18.15 and 60.85 million respectively. In addition to the average value, the table shows minimum, maximum and standard deviations of the variables (Table 1).

Table 1. Summary statistics of study variables 1980 to 2018

Variables	Mean	Maximum	Minimum	Std. Dev.	Observations
RGDP	280053.1	865807.2	101802.6	218783.3	39
INF	8.97	36.40	-10.57	9.86	39
GINV	108796.5	809233.5	1336.616	209260.6	39
EXHED	4.30	6.42	2.24	1.31	39
TAXR	48.57	287.562	1.623	79.532	39
LF	34.49	60.85	18.15	12.54	39

Source: Eview's computed result

The trends of Ethiopian overall output growth experienced up and down fluctuations from positive to negative and vise-versa growth during the enquiry period. The highest RGDP growth rate during Derg-era recorded 13.14% in 1987 while least growth was -8.8% in 1985 due to frequent drought and civil war along with distorted economic policy followed by the socialist government (Figure 1). On the other hand, there has been positive growth and fluctuation trend observed after the economic reform took place except for the year of 1998 and 2003 in which Ethiopia economy has challenged by external shocks such as famine and Eritrean war devastated the economic growth (Figure 1). Regarding the trend of tax revenue as presented in figure-1, it showed an erratic ups and downs movement from positive to negative and turn back. During the pre-reform period due to unfavorable economic policy and unstable political situation, the government tax collection practice varied from 26.32% in 1988 to -24.56% annual growth rates in 1990. After reform the tax revenue collection shows relatively stable change. As it can be noted from the Figure 1, the Ethiopian economic growth and tax revenue experienced almost similar oscillation.



Source: Author computation (2020)

Figure 1. Trends of real GDP growth and tax revenue

Test statistics

Unit Root Test

The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests were applied to all variables in levels and in first difference in order to formally establish their order of integration. Table-2 below deals with ADF and PP test results of the series at the level and first differences with constant specification. The ADF test result shows, all the variables except rate of inflation, are non-stationary at level and become stationary at the first difference at one percent level of significance. Rate of inflation was stationary at level with one percent significance level. Furthermore, the results under Phillip-Perron (PP) unit root tests show that government expenditure on education and health service as percentage of GDP; tax revenue and gross investment become stationary at the first difference at one percent level of significance (Table 2). However, real GDP and labor force were stationary at the first difference with intercept, at 5% level of significance. The inflation rate is stationary at level form under Phillip-Perron (PP) unit root tests.

From Table 2; it is evident that none of the variables were I (2) and hence we moved on with the ARDL co-integration technique since it is capable of dealing with I (0), I (1) or a mixture of both order of integration of variables. This suggesting preceding co-integration test using the

ARDL approach (bounds test approach of cointegration) was developed by Pesaran et al. (2001).

Table 2. Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP) unit root tests

Variables	ADF			PP		
	With intercept			With intercept		
	At level	1st difference	Order of integration	At level	1st difference	Order of integration
LNRGDP	3.346791	-4.242203***	I(1) at 1%	3.828124	-3.1028**	I(1) at 5%
LNTAXR	0.705111	-3.705287***	I(1) at 1%	1.255337	-3.6302***	I(1) at 1%
LNGINV	1.384843	-5.841487***	I(1) at 1%	1.587041	-5.8418***	I(1) at 1%
LNLF	0.406929	-4.148631***	I(1) at 1%	2.583002	-3.793012**	I(1) at 5%
INF	-4.1888***	-8.636534***	I(o) at 1%	-4.2165***	-11.15152***	I(0) at 1%
EXHED	-1.113150	-5.657210***	I(1) at 1%	-0.917944	-6.2508****	I(1) at 1%

Source: Computed using Eviews 9.0 Package

Note: I () represents order of integration and ***, ** and * denotes significance at the 1%, 5% and 10% levels, respectively.

Bounds Tests for Co-integration

One of the important issues which must be addressed in employing ARDL is selecting optimum lag length. Prior to undertaking co-integration test with help of ARDL bound test, the maximum lag length must be determined. Pesaran and Shin (1999) and Nayaran (2004), recommended choosing a maximum of 2 lags for annual data series. Accordingly, this analysis set the maximum lag length at 2 years which is sufficiently long enough for annual data series to investigate the variable relationship.

The construction of the co-integration bounds test entails the evaluation of F-statistics against the critical values. The results revealed that the test is significant at 5% level (Table 3). As the F-statistic (4.397) was above all the upper bound value at 10%, 5% and 2.5%, the null hypothesis of no long run co-integration is rejected. The results confirm the presence of a long-run relationship between the regressor and regress and variables.

Table 3. Bound Test for Co-integration

Levels	Bounds	Critical Values
10%	Lower Bound I(0)	2.26
	Upper Bound I(1)	3.35
5%	Lower Bound I(0)	2.62
	Upper Bound I(1)	3.79
2.5%	Lower Bound I(0)	2.96
	Upper Bound I(1)	4.18
1%	Lower Bound I(0)	3.41
	Upper Bound I(1)	4.68
F-statistics: ARDL(1, 0, 0, 0, 2, 1)		4.397738** (K-5)

Source: Computed using Eviews 9.0 Package

Diagnostic and stability test

To check for the consistence of variables included, several diagnostic and stability tests have been conducted. Most tests results such as the Jarque–Bera normality test, Ramsey RESET stability test, Breusch–Godfrey Serial Correlation LM test and Breusch-Pagan-Godfrey heteroskedasticity were successfully passed (Table 4). Thus, diagnostic tests results indicate that long- and short-run estimates are free from serial correlation, misspecification of the model, non-normality of the error term, and heteroscedasticity.

Table 4. Result of the diagnostic test for ARDL model (1, 0, 0, 0, 2, 1)

Diagnostic Tests	Statistics	Results	Conclusion
Heteroskedasticity Test: Breusch-Pagan-Godfrey	F-statistic	1.0019	No heteroskedasticity problem
	Prob. F (9,26)	0.4630	
	Prob. Chi-Square(9)	0.4127	
Ramsey RESET Test	F-statistic (2, 24)	1.6283	Equation is correctly specified
	Prob.	0.2172	
Breusch-Godfrey Serial Correlation LM Test	F-statistic	4.4981	No serial correlation
	Prob. F (2,24)	0.0219	
	Prob. Chi-Square(2)	0.0074	
Multivariate Normality Test	Jarque-Bera	1.4535	Residuals are normal
	Prob.	0.4834	

Source: Computed Using Eviews 9.0 Package

In accordance with Pesaran and Pesaran (2009), who stresses the need to analyze the stability of the long-run coefficients in conjunction with the short-run dynamic model, the cumulative of the recursive residuals (CUSUM) as well as the cumulative sum of squares of recursive residual (CUSUMQ) were investigated empirically (Figures 2 and Figure 3). The plots of CUSUM and CUSUMQ test statistics show that the blue line does not cross the red one and rests neatly within the boundaries at 5% significant level. Hence, we can conclude that long-run estimates are stable and there is no any structural disruption.

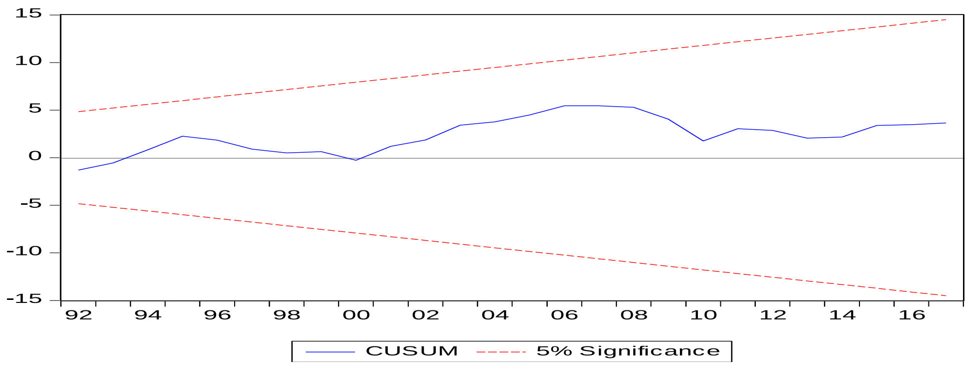
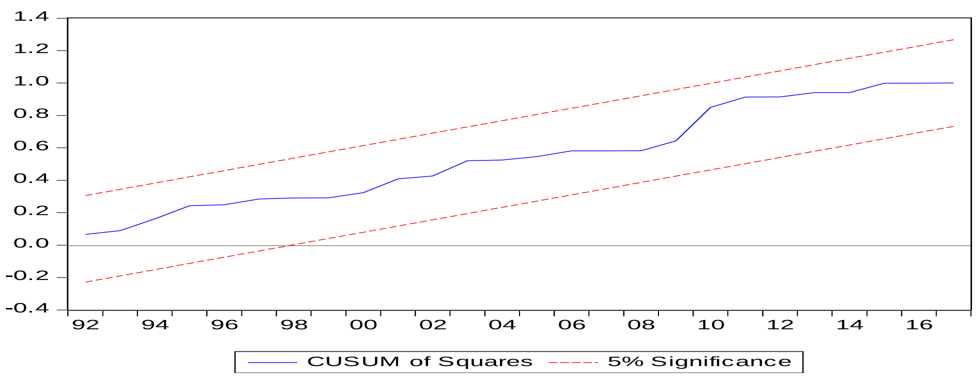


Figure 2: The cumulative of the recursive residuals (CUSUM)



Source: Computed using Eviews 9.0 Package

Figure 3. The cumulative sum of squares of recursive residual (CUSUMQ)

Long-run and Short-run Model Estimation Results

Table-5 represents the long run effects of independent variable included in the model on real GDP and the coefficients of all variables have shown their hypothesized signs. The long-run coefficient results for our model indicate that government tax revenue (LNTAXR); government expenditures on education and health as proxy of human capital (EXHED) and rate of inflation (INF) variables have statistically significant effect on real GDP (LN$RGDP$) in Ethiopia. The estimation result represents that the time lag exerts a positive effect on real GDP. This suggests that holding all other factors constant in the long run, as time passes by, the real GDP of Ethiopia will grow by about 10.93% each year. This is may be due to the fact that as time span on, technology, institutions and human behavior will become mature and such changes will result in positive growth in the real output.

Tax revenue has an expected positive and significant effect on Ethiopian real GDP (economic growth) at 5% level of significance. The coefficient of 0.31 indicates that in the long run, a 1% increase in tax revenue will lead to approximately 0.31% increase in real GDP. This is due to the fact that tax revenue would lead to economic growth when it is used to undertake infrastructural developments and spending in other sectors by the government to increase productivity and output. This result is consistent with the findings by Wisdom (2014); Mullen; Williams (1994) and Karran (1985) and in that all found a positive and significant effect of tax revenue on economic growth. From the theoretical perspective, this finding is also consistent with the theory of Friedman (1978), who postulated that raising tax revenue either through increasing tax rates or tax base would lead to more fiscal space which will drive growth.

The government expenditure on health and education (EXHED) which is proxy of human capital has shown positive and statistically significant effect on real GDP in the long run. The coefficient of 0.0744 reveals that in the long run, a 1% increase in human capital investments will lead to approximately 0.0744% increase in real GDP. The economic justification is that human capital development enhance long run economy through inducing technology and innovation that leads to increased productivity. This result is in line with finding by Tekilu et.al (2019), they exhibited the positive effect of human capital on economic growth of Ethiopia. On the other hand, the long-run estimated coefficient of inflation rate has found to be a negative sign and significant effect on real economic growth at 10% level of significance. The result discloses that a one percent increase in inflation will decrease economic growth by 0.0089 percent. High rate of inflation adversely affects real GDP due to consequential macroeconomic instability. This shows that a higher level of inflation represents distortion in an economy.

Table 5. Long-run ARDL Estimation Results

Variable	Coefficient	Std. Error
LNTAXR	0.313841**	0.1352
INF	-0.008999*	0.004460
EXHED	0.074432*	0.030615
LNLF	-0.171522	0.36669
LNGINV	0.089446	0.195124
C	10.934285***	1.256450

Source: Computed Using Eviews 9.0 Package

The sign of ***, ** and * denotes significance at the 1%, 5% and 10% levels respectively

If the variables are co-integrated, their dynamic relationship can be specified by an error correction representation in which an error correction term (ECT) computed from the long-run equation must be incorporated in order to capture both the short-run and long-run relationships (Engle and Granger, 1991). The ECT is expected to be statistically significant with a negative sign. The negative sign implies that any shock that occurs in the short-run will be corrected in the long-run. If the error correction term is greater in absolute value, the rate of convergence to equilibrium will be faster. The coefficient of the ECT -0.288276 implies that, the short-run coefficients adjust towards their long run value at 28.8% every year in the event of an exogenous shock. This negative and significant coefficient is an indication that co-integrating relationship exists among the variables.

Table 6. Results of Short-Run Error-Correction Model (VECM)

Variable	Coefficient	Std. Error
D(LNRGDP(-1)	0.711724***	0.102049
D(LNTAXR)	0.090473*	0.031997
D(INF)	-0.001521*	0.000850
D(LNLF)	-0.049446	0.108535
D(EXHED)	-0.023210	0.018610
D(EXHED (-1))	0.044667**	0.018925
D(LNGINV)	0.025785	0.058263
ECT(-1)	-0.288276***	0.102049

Source: Computed Using Eviews 9.0 Package

The sign of ***, ** and * denotes significance at the 1%, 5% and 10% levels respectively.

The short-run estimate coefficient of the VECM explains the short-run relationships between real output growth and explanatory variables as depicted in table-6. In short-run, real economic growth is determined by tax revenue, human capital and inflation rate. As expected, the tax revenue is significant at lag one in the short run where it exerts a positive effect on real GDP with coefficient of 0.090473. The coefficient recalls that a percent increases in tax revenue leads 0.0904% increment in overall output growth. The finding contradicts the arguments of Biruk (2016), which examined the short and long run fiscal independence between tax revenue and economic growth in Ethiopia. The result is in similar with works of Ogbonna and Ebimobowei (2012) and Wisdom (2014) in that they found a positive and significant effect of tax revenue on economic growth in the short-run. Moreover, the economic growth represented by real GDP is determined by human capital and rate of inflation in the short run. Rate of inflation negatively affects the economic growth in short-run due to its destabilization of economic performances. Human capital denoted by government expenditure on health and education has positive and significant influence on real GDP at 5% level. The coefficient reveals a 1% increase in human capital investment results 0.044% increase in RGDP in short run.

Conclusions

This research endeavored to examine the long and short run relation between tax revenue and economic growth in Ethiopia. The study used time series macroeconomic data from 1980 to 2018, which was compiled from World Bank Economic Indicators and IMF World Economic Outlook database. The Autoregressive Distributed Lag (ARDL) model was employed to verify the long and short run link between variables. The data were tested for stationarity using ADF and Phillip-Perron (PP) tests; bounds tests for cointegration; diagnostic and parametric stability tests and all the results show the viability of data to proceed with ARDL model. The results of the VECM reveal that the error correction term for economic growth shows statistical significance and the expected negative sign.

From the findings, it can be concluded that both the long-run and short-run results found statistically significant positive effects of tax revenue on economic growth in Ethiopia. From the theoretical perspective, this finding is also consistent with the theory of Friedman, who postulated that raising tax revenue either through increasing tax rates or tax base would lead to more fiscal space which will drive growth. In addition, human capital and inflation rate have shown positive and negative significant influence on real GDP growth respectively. Based on the findings, the government needs to give more effort to expand the tax base and should increase the efficiency of collection since tax revenue has positive effect on overall economic growth in long and short run. Moreover, the policy measure which enhances human capital development and stable macroeconomic environment inspire the country's real economic growth.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this article.

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