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Taxation and Economic Growth Nexus: Using ARDL and BOND Testing Procedures

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Abstract: This study analyses the nexus of taxation on economic growth using ARDL and BOND procedures. Pre-estimation tests were carried out to determine homoscedasticity, serial auto correlation, multicollinearity and normality of the variables. The coefficient of determination showed that 77.37 percent of the variation in GDP is explained by in direct taxes, other taxes, interest rate and foreign direct investment. The findings further revealed that the coefficient of indirect taxes was negative and individually significant in influencing the economic growth in Sierra Leone in the short run. On the other hand, the coefficients of interest rate are revealed to be positive and separately significant in affecting the economic growth in Sierra Leone in the short run. In view of these findings, it implies that indirect taxes increase consumption and reduce savings.

Introduction

The main challenge of governments worldwide is to continually increase the welfare of its people through the implementation of appropriate economic policies and programs. Governments attempt to achieve this objective by providing public goods, such as roads infrastructures and public services such as education, security, and health, sanitation among others, hence forming the economic and social infrastructure. The adequacy of such infrastructures is a firm foundation for a country's economic growth and development. If

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possible, all public expenditures should contribute to the creation and promotion of an empowering domestic economic environment for local and foreign investments, boost both local and international trade; attract tourists and other foreign visitors, increase agricultural productivity; and boost craftsmanship and small-scale industrial production. All these economic activities generate productive employment and hasten economic growth and development in the short, medium and long terms (Duramany-Lakkoh, 2020).

Public expenditure by any government whether central, regional or local, is financed primarily through taxation. The effect of such taxes on growth of an economy can only remain positive if taxes levied create the right incentives, depending on economic activities, for the efficient allocation of resources in a given country. Additionally, in order to improve the welfare of its citizens, a given government should adopt fiscal policies with a tax structure that maximizes positive externalities while minimizing negative externalities, such as pollution and corrupt practices. Musgrave (1997) postulated a law of public expenditure growth in the United States of America, where, as national income per capita grew, so did government tax revenue when compared on percentage basis to the GNP. The implication of this is that as the U.S. registered economic growth, so did the country's tax effort. The authors' findings are in conformity with Ariyo (1997) empirical findings in the discipline of development economics which indicate that as a country's economy grows, its tax base grows commensurately. However, growth rates of both the economy and tax capacity tend to differ among the countries for different periods of time, due to both short- and long-term causative factors, including internal and external economic shocks.

William (2021) while studying effects of changes of taxation on economic growth found out that increase in taxation negatively affects the growth of an economy. However, similar to many economic questions, it is vital to review the past information for confirmation of what the theory indicates. The relationship between taxation and economic growth for a given country has been one of the most significant matters in economics (Onduru, 2003). However, while it is clear that the level of taxation could impact on country’s GDP level, the theoretical link between this factor and growth of an economy was not explicitly recognized in the normal neoclassical models. Smith (1776) explained growth in terms of savings and capital accumulation in the context of laissez faire while Keynes argued for a greater involvement of the state to bolster production, employment, aggregate demand and consumption. Romer (1986) stressed on investment in human capita and on technical progress as sources of long-term growth.

According to Duramany-Lakkoh (2021), the ever-dwindling external financing, there has been an increasing need for developing countries to mobilize their internal resources instead of relying on external credit. The single most important instrument of internal resources mobilization is an effective tax structure compromising of taxes whose yields are more income-elastic and exhibiting greater automatic response to changing needs of the economy.

Certain drawbacks have been pointed out in theoretical literature by (Bhatia, 2016). Prominent among these drawbacks is the likelihood of shifting the tax burden between either producers and consumers or sellers and buyers although this would depend on elasticities of supply and demand. These taxes also tend to be regressive especially when they are imposed on commodities, which are considered as necessities by a particular society. Such commodities are income-inelastic and hence are likely to put unequal burden on people with different income levels. Moreover, while direct taxes have only income effect on consumption via their effect on disposable income, indirect taxes have both

income and substitution effects. Hence the later will impose a greater excess burden on the society (Bhatia, 2016). Despite the foregoing, taxation remains the only alternative capable of molding the production and investment activities of these economies by guiding resource allocation towards more productive sectors of the economy. With the ever-increasing Government expenditure budgets, there is pressure and focus to ensure that there are improved tax revenue collections.

Over the years, revenue from taxes has been noted to increase with growth in GDP in Sierra Leone. Some analyses have revealed that taxation impact positively on growth while others found a negative relationship (Mohamed, 2022).

In Sierra Leone, the situation is not different and as such the Government has been changing tax structure where the existing one has not yielded the much-targeted amounts of tax revenue. This ends up resulting into inequality or skewed income distribution. The essence of this study is to determine the impact of taxation on the economic growth of Sierra Leone, and how does it influence the fiscal policy tools to accelerate economic growth. It is against this background that the study attempts to establish the connection between indirect taxes and direct taxes on economic growth and suggest an optimum model/structure for use in Sierra Leone. Additionally, the study will make a contribution to the existing literature on this area (Samuels and Duramany-Lakkoh, 2023).

This research paper attempted to address the following questions:

a. What is the impact of taxes on economic growth in Sierra Leone?
b. If taxation impacted economic growth positively, how has this growth been translated the lives of the ordinary people?

The general objective of this study is to establish the relationship between taxation and the Sierra Leone economic growth. The specific objectives of this study are as follows:

a. To identify the impact of taxes on economic growth in Sierra Leone
b. To examine the relationship between taxation and economic growth on the ordinary lives of the people.

In this study, focus is made on economic growth resulting from taxation because growth is among the key objectives to any government. Also, it is paramount to be aware of the contribution of indirect and direct taxes to this objective as a means of evaluating the overall impact of fiscal policy on economic growth.

Moreover, since taxation has been noted to impact either positively or negatively on growth, the findings of this paper is informative in terms of policy implications grappling with revenue shortfalls and alarming external debts. This study provides a model which policy makers may use in future when designing a direct and indirect tax structure capable of influencing economic growth.

Research Method

Theoretical Model

The theoretical model is centered on the study of taxation and economic growth as hypothesized (Ogbonna and Appah (2016). Egen and Skinner (1996) hypothesize their study from an accounting framework first developed by Solow (1956) and Swan (1956). In this approach, an economy's yield (y), normally measured by GDP, is controlled by its monetary assets, the size and expertise of its workforce (m), and in conclusion the size and innovative efficiency of its capital stock (k). Accordingly, a nation well-endowed with resources might

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be relied upon to have higher per capita output than one not plentifully supplied with assets since its (per capita) capital stock is so much bigger and all the more mechanically progressed and its specialists have more abilities, or human capital. The contention progressed by these creators in this way, is development rate of monetary yield subsequently will rely on upon the development rate of these assets; physical capital and human capital and in addition changes in the basic profitability of these general contributions to the economy. Engen and Skinner (1996) decomposed the development rate of the economy's growth rate into its different segments as follows:

yi = aiki+ bmi+ ui …… Equation (1)

Where the real GDP rate of growth of an economy, let's assume i is meant yi and the net venture rate (communicated as a small amount of GDP), proportionally the change after some time in the capital stock, is given by ki. The rate development rate in the powerful work drive after some time is composed m, while the variable, ui, measures the economy's general profitability development. There are two other applicable factors in condition (1), which are the coefficients measuring the peripheral profitability of capital, ai, and the yield flexibility of work, bi.

Lee and Gordon (2005) apply this same principle of a production function as conceptualized by Egen and Skinner (1996) to specify an econometric model to study the taxation effects on rate of growth of per capita GDP. The basic specification used by Lee and Gordon (2005) is as follows:

$GR = B_0 + B_{1v} + B_{2t} + B_{3s} + X_y + e$ ……Equation (2)

Where GR represents an annual rate of growth of GDP per capita, v represents the top statutory corporate tax rate, t represents personal income tax rate, s represents the consumption tax rate, and X represents the control CED vector, including the log of GDP per capita, government expenditures over GDP, the primary school enrollment rate, a measure of trade openness, the average tariff rate, an index for corruption and the quality of the bureaucracy during, the average inflation rate from, and the annual rate of population growth from. This study was based on a cross-sectional data set of countries. Egen and Skinner (1996) however, caution that one should be wary of such data due to the biases and mis-measurement of productivity in income and the variation across countries in administrative practices.

Ogbonna and Appah (2016) in their study on effect of tax reforms to economic growth of Nigeria followed closely the econometric specification used by Lee and Gordon (2005) but took a country specific approach. Their econometric specification was modified as follows.

$GDB = a + B_1PPT + B_2CIT + B_3VAT + B_4ET + B_5PIT + B_5 + e$……..Equation (3)

Where GDP is gross domestic product, PPT is Petroleum Profit Tax, CIT is Companies Income Tax, VAT is Value Added Tax, ET is Education Tax, PIT is Personal Income Tax, and CED is Custom and Excise Duties. Their specification ignores the control vector X and uses time series analysis from 1994 to 2009 which is not long enough to determine the long-term impact of tax reform on economic growth.

Empirical Model Specification

This study applied the analytical framework as conceptualized by Egen and Skinner (1996) and consequently specified in both the modified versions of the Lee and Gordon (2005) and Ogbonna & Appah (2016). The cointegration diagnostic testing is based on Johansen Cointegration test approach to the analysis of long-run relationships. The model has used the modified version of Ogbonna & Appah (2016) to determine the relationship between economic growth and taxation in Kenya.

The relationship between economic growth and taxation can be specified as;

Gdp = ƒ (it, dt, ot,)..... Equation (4)

In addition to the taxation variables, attempt was made to control for interest rates, foreign direct investment (FDI), and net exports which determines a country's growth rate yet not really connected to composition of tax revenue.

The relationship between economic growth, taxation and other control variables then becomes;

Gdp = ƒ (it, dt, ot, ir, fdi, nx).....Equation (5)

Where:

Gdp = is the real Gross Domestic Product which measures economic growth. *dt* =direct Taxes (being made up of VAT, Customs Import Duties and Excise Duties). *ot* = Other taxes.

Ir = Interest rate.

fdi = Foreign Direct Investment inflows.

The empirical analysis used annual time-series data on taxes, control variables and economic growth for the period 1975 to 2014. The specific econometric model becomes;

$GDP = a + b_1IT + b_2DT + b_3OT + b_4IR + b_5FDI + e$ ……Equation (6)

Where: GDP is Gross Domestic Product, a is the constant term, IT is indirect taxes, DT is direct taxes, OT is other taxes, IR is interest rates, FDI is Foreign Direct Investment, b1-5 are the relevant coefficients for the relevant variables and e represents the random error term. Since the study used time series data in analysis, it was important to undertake various tests to avoid spurious or nonsensical modeling. The test carried out included ADF test, Auto correlation, cointegration, Breusch-Godfrey test and heteroscedasticity.

Pre-Estimation Tests

Several tests to give the model the proper functional and mathematical form were conducted. The first phase was to undertake a diagnostic test on each of the relevant variables in determination of its Stationarity. The ADF test for unit root was utilized. A correlation analysis was also undertaken to ascertain the relationship between the regress and the regressors. Further, a normality test was carried out to check whether the data follows a normal distribution and to ensure normality of the residuals.

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Estimation Techniques

By establishing and analysing the long-run relationship between the determinants of tax and economic growth (GDP) as well as the dynamic interactions among the other variables of interest empirically, the Autoregressive Distributed Lags (ARDL) cointegration procedure developed by Pesaran (1997) is used.

The ARDL model for the long run of BTTR (GDP) of Sierra Leone can thus be specified as;

$\Delta GDP_t = \alpha_0 + \sum^{n}_{i=1}\alpha 1i\Delta GDP_{t-1} + \sum^{n}_{i=1}\alpha 2i\Delta IT + \sum^{n}_{i=1}\alpha 4i\Delta OT + \sum^{n}_{i=1}\alpha 5\Delta iIR + \sum^{n}_{i=1}\alpha_{6i}\Delta FDI + \varepsilon_t$……*Equation* (7)

The essence of using the ARDL is to estimate the model centred on the following purposes:

The Autoregressive Distributed Lags cointegration procedure is comparatively more effective even in small sample data as in the case of this study. The ARDL enables the cointegration to be estimated by using the Ordinary Least Square (OLS) techniques since the lags of the models are known. Actually, this will not be in the case of other multivariate cointegration procedures such as the Johansen cointegration Test. Actually, this makes the ARDL procedure relatively easier. Because it does not demand pretesting of the variables included in the model for unit root compared with other methods like in the case of Johansen approach.

Unit Root Test

None of the economic decision cannot be taken if it fails to satisfy the conditionality of unit root test. It is very much important to test for the statistical properties of variables when dealing with time series data. Regression pertaining non stationary time series often lead to the problem of spurious regression. A time series can be stationary if its average means variance and auto – covariance is independent of time. The research makes use of the Philips Perron and Augmented Dickey Fuller tests. Both of these tests are similar expect that are differ with respect to the way correct for auto correlation in residuals. The ADF and PP test the null hypothesis that a series contains unit root that is non-stationary as against the alternative hypothesis of no unit root is stationary. Such as;

H_0: $\beta=0$ (N_t is non stationary)

H_1: $\beta=0$ (N_t is stationary)

ARDL Techniques and Bond Testing Procedure

The Autoregressive Distributed Lag cointegration test, commonly known as bound test developed by Pesaran (1997) is used to test for the cointegration relationship among the series in the model. Two or more series are said to be co-integrated if each of the series taken individually is non-stationary with I (1), while their linear combination is stationary with I (0). In a multiple non stationary time series, it is possible that there is more than one linear relationship to form a cointegration. The research therefore applies the ARDL cointegration to the system of the five variables in the buoyancy of total tax revenue equation to investigate the existence or otherwise of long-run equilibrium relationship among the variables. There are three main steps in the ARDL Bond test. The first step is to estimate the equation (8) by OLS in order to test for the existence or otherwise of a long-run

relationship among the variables. This is actually done by conducting an F-Statistic for the joint significance of the coefficient of lagged level of the variables. The hypothesis would be;

$H_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = 0$

$H_1 \neq \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq 0$

If the F-Statistics is above the upper critical value, the null hypothesis no long-run relationship is rejected regardless of the orders of integration for the time series. On the other side, if the F-Statistics is below or less than the lower critical value, therefore the null hypothesis is accepted, meaning that there is no long-run relationship among the series. But however, if the F-Statistics ranges between the lower and the upper critical values, the results become inconclusive.

For the second step of the ARDL bound approach, once the cointegration is established the Finally, the ARDL bound approach is to estimate an Error Correction Term (ECT) to capture the short-run dynamics of the system. The ECT generally provides the means of reconciling the short-run behaviour of an economic variable with its long-run behaviour. The ECT is specified as;

$$\Delta GDP_t = \alpha_o + \sum^{n}_{i=1}\alpha 1i\Delta GDP_{t-1} + \sum^{n}_{i=1}\alpha 2i\Delta IT + \sum^{n}_{i=1}\alpha 4i\Delta OT + \sum^{n}_{i=1}\alpha 5i\Delta IR + \sum^{n}_{i=1}\alpha 6i\Delta FDI + {}_{\lambda}ECT_{t-1} + \varepsilon_t \quad \text{Equation (8)}$$

Where ECT_{t-1} is the Error Correction Term. The coefficient of the Error Correction term, λ measures the speed of adjustment to obtain equilibrium in the event of shocks to the system.

Determination of Lags

For the appropriate model selection of the long-run underlying equation, the study applied the Schwarz Bayesian Criterion (SBC), Akaike information criterion (AIC), Final Prediction Error (FPE) and Hannah Quinn information criterion (HQIC) to choose the optimal lag length of each of the underlying variables in the model, with the criterion with the lowest value of information been selected.

Serial Correlation

The estimators of model with lagged dependent variables are sensitive to the auto correlation of the error terms. To determine the lag length which implies the elimination of auto correlation of the error terms, the lags are added until the error term of white noise, the Durbin Watson test was used to test for auto correlation.

Diagnostic Test

For the diagnostic checking, the research will test the presence of serial correlation and heteroscedasticity in error and normality of error as well. Finally, by also using the CUSUM and CUSUMSQ tests, this paper will also be able to check the stability of the parameter of the model.

The tests were conducted to ensure the fitness of the model and to examine the structure of the residuals to ascertain the conclusions to be made from the estimated results. The tests in this study included: the Ramsey RESET test was undertaken to test for errors in model specification, residual normality test, Breusch Godfrey test for serial correlation and heteroscedasticity test. This test was necessary to review the long-run

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relationship between the level of taxation and economic growth. The estimation method adopted here was based on the Maximum Likelihood Estimator (MLE) of the parameters of a co-integrating Vector Error Correction Method (VECM).

Definition and Measurement of Variables

In this study, the following variables were measured in absolute monetary terms and specifically in Sierra Leone Thousands of Leone.

GDP is the total production within the country by all residents irrespective of nationality. In this study, GDP is measured in real per capital basis.

Direct taxes are also income taxes derived in Sierra Leone levied on corporations and individuals in Kenya whether resident or non-resident.

Indirect taxes are made up of VAT; Customs import duties and Excise duties. VAT is a consumption tax levied in Sierra Leone at 15% on designated local supply of good and services.

Other taxes are other taxes that include fines, penalties and forfeitures, land rent, trading licenses, air passenger service charge, air navigation charges, second hand motor vehicle purchase tax, betting tax, casino tax, stamp duty, premium tax, fuel levy, standards levy and sugar development levy, among others.

Interest rates refer to the rate commercial banks charge private investors who borrow from them so as to invest in productive projects.

FDI inflows refer to foreign direct investment that an economy receives from other countries for development.

Net Exports represents the difference of trade activities between the exports of a country from

Results and Discussions

Descriptive statistics

Table 1: Descriptive statistics result

Sample: 1990 - 2018

	GDP_GROWTH	IRD	TAXES	FDI	OTHERS
Mean	3.001304	13.70819	8.567310	0.149766	0.087802
Median	4.192610	9.722500	8.234108	0.053095	0.054374
Maximum	26.41732	54.66667	17.39048	0.950478	0.346678
Minimum	-20.59877	4.485833	3.643427	-0.007463	0.000000
Std. Dev.	9.497884	12.52655	3.207095	0.232720	0.104954
Skewness	-0.260054	2.322716	1.165380	2.051917	1.727363
Kurtosis	4.539919	7.124492	4.218519	6.793920	4.606885
Jarque-Bera	3.192253	46.63138	8.358321	37.74263	17.54163
Probability	0.202680	0.000000	0.015311	0.000000	0.000155
Sum	87.03781	397.5374	248.4520	4.343206	2.546272
Sum Sq. Dev.	2525.874	4393.606	287.9929	1.516442	0.308428

Source: Author's computation (EViews 12)

Descriptive statistics of the data series is shown in the table 1. Descriptive statistics of GDP, interest rate, taxes, FDI and others. Distribution of series can be determined by evaluating various statistical measures as indicated in table 1.

The total observations considered in this study were 40 with five variables (one dependent and four independent variables). Range is obtained from the difference between the maximum value and minimum value. For example, the maximum value of GDP is 26.41732, while the minimum is -20.59877. the standard deviation indicates the spread of the values from the mean and is of great importance for evaluation purposes. For example, the data indicates that interest rate has a larger spread as compared to other variables. GDP has a standard deviation of 9.497884, interest rate 12.52655, direct tax has 3.207095, FDI has 0.232720 and others tax have 0.104954.

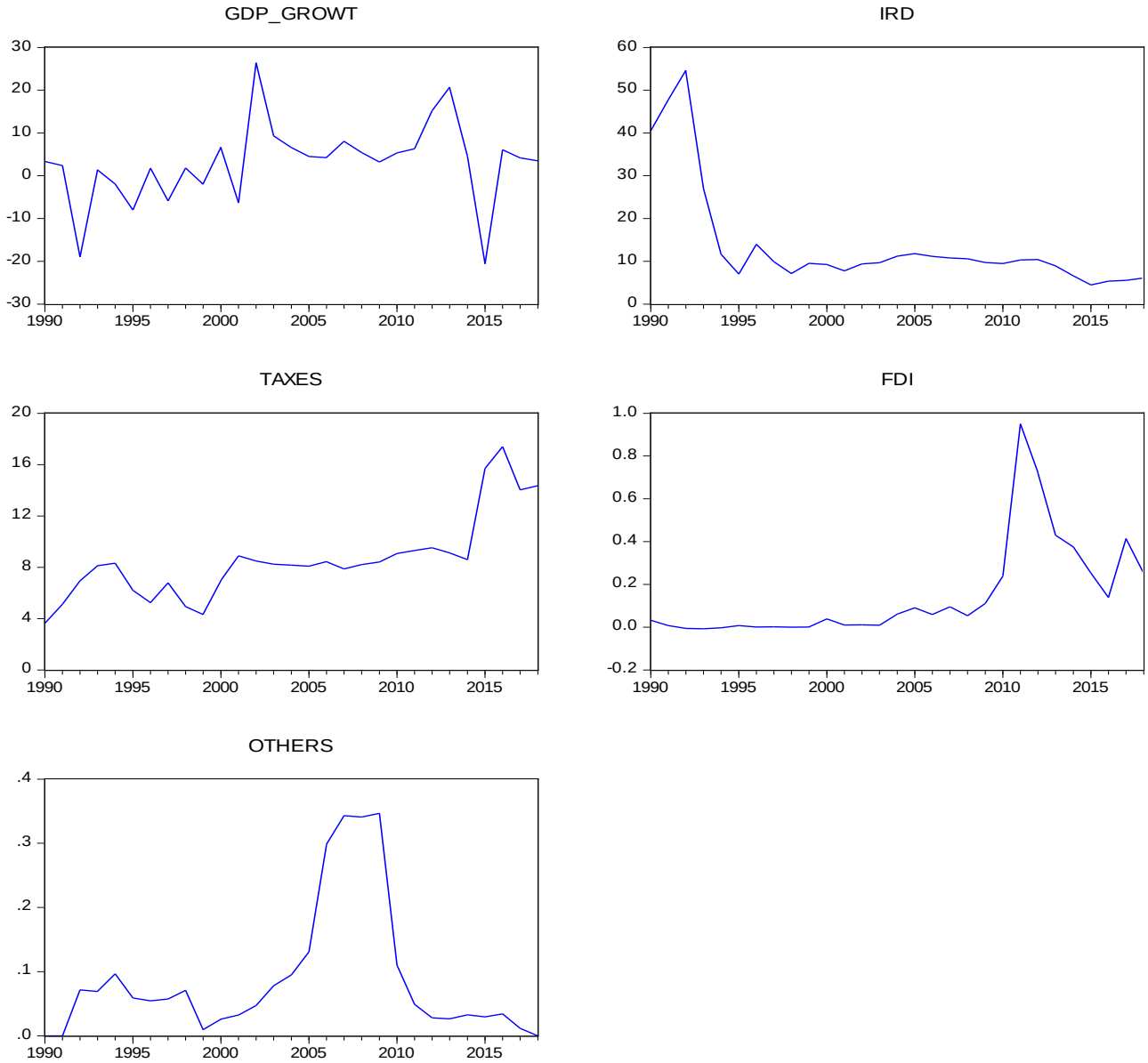

Figure 1: Trend graphs for the chosen macroeconomics variables in the model.
Source: Author's computation (EViews 12)

Lag selection criteria

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The optimal number of lags included in the test was based on automatic selection by Akaike information criteria (AIC).

Therefore, before the estimation of the ARDL model, there is need also to determine the optimal lag length criteria, LR: Sequential modified LR test statistic (each at 5% level), FPE: Final Prediction Error, AIC: Akaike information criteria, SC: Schwarz information criteria, HQ: Hannan-Quinn information criteria.

Table 2: Lag Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-204.4323	NA	6.827639	16.11017	16.35212	16.17984
1	-137.5763	102.8553*	0.284628*	12.89049	14.34214*	13.30851
2	-109.7228	32.13864	0.290885	12.67099	15.33235	13.43736
3	-77.79061	24.56325	0.356982	12.13774*	16.00881	13.25247*

* indicates lag order selected by the criterion

** indicates lag order selected by the criterion*

NOTE, * indicates lag order selected by the criteria.

Source: Authors' computation (EViews 12)

From the result above in Table 2. a lag length of one (1) was chosen as the maximum lag length based on the Akaike information criteria (AIC) and the Schwarz Bayesian criteria (SBC). In theory, it is also consistent with Pesaran (1997) who recommend choosing a maximum lag length of 2 for small sample annual data.

Unit Root Tests Results

Although the bound test (ARDL) approach to co-integration does not require the pretesting of the variables of unit root, it is very much essential to conduct this test, to actually confirm that the variables are not integrated of an order greater than one. The main essence is to verify the absence of I (2) variables to free the results from spurious regression.

Table 3: Unit Root Test Results

		ADF test statistic (Intercept with no trend)		PP test statistic (Intercept with no trend)		
Variables	Lag	Level	1st Difference	Level	1st Difference	Conclusion
GDP_growth	1	-4.586246***	-	-4.584966***	-	I_1
FDI	1	-2.016627	-5.905177***	-2.069673	-5.366752***	I_1
IRD	1	-4.007968	-	-3.554797**	-	I_1
Taxes	1	-1.426065	-5.811204***	-1.526986	-7.574015	I1
Other Taxes	1	-2.175082	-3.850653***	-1.909874	-3.841612***	I_1
WAR						
EBOLA						

*Source: Authors' computation (EViews 12). Notes: ***, ** (*) denotes significance at 1%, 5% and 10% respectively*

By establishing the stationarity of the various, the study conducts a unit root test in order to ascertain whether the variables are stationary in level or non-stationary, before applying the Autoregressive Distributed Lags approach to cointegration. The Augmented Dickey Fuller and Philips Perron tests were applied to all the variables in order to establish their order of integration. From the unit root test result in Table 3. it is clearly shown that all the results are I (1) variables, it implies that they are stationary at first difference. Both the Augmented Dickey Fuller (ADF) and the Philips Perron test (PP) unit root test results are in line with each other. Hence, the test results have confirmed the absence of I (2) variables, the ARDL methodology is used for estimation.

Cointegration Analysis

Given that the primary objective of this study is to establish the nexus between taxation and economic growth therefore it is good to test for the existence long run equilibrium relationship between these two variables within the framework of the bound testing approaching to co-integration.

The study employs annual time series data, and therefore uses a lag length of one (1) in the bound test as determine by the result in Table 5.

The dependent variable is GDP is regressed on the other variables to ascertain the cointegration relationship between the dependent variable and independent variables. The F-test is used to determine whether there exists a long run relationship of cointegration among the various variables or not.

Table 4: Bounds test result

Test- Statistics	Value	Lag	Bound critical values (restricted intercept with no trend)		
			SIGNIFICANCE LEVEL	I (0)	I (1)
			1%	2.88	3.99
F-Statistic	18.89344		**5%**	2.27	3.28
K	6		10%	1.99	2.94

*Source: Author's computation (EViews 12). *Base on Narayan (2004)*

From the result in Table 4 above, it is clearly shown that the calculated F- Statistic when taxation and the GDP (GDP) is the dependent variable is 18.89344, which is higher than the upper bound critical value of the 5 percent level of significance (18.89). It actually implies that the null hypothesis of no cointegration is rejected at the 5 percent level and therefore there is need for cointegration relationship among the taxation of GDP and its determinants.

Ideally, the study concludes that there is existence of cointegration among the variables in the tax equation, hence we proceed with the estimation of the long – run model.

Static Long-Run Results based on SIC-ARDL (1,2,2,2,1,2,2)

Given that the bounds test indicates the existence of cointegration, wherein LBTTRGDP was used as a dependent variable, it is good for us now to estimate the long-run model for the long-run coefficient. Below is the long-run result in Table 5.

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Table 5: Long-run Estimates based on the SIC-ARDL (1,2,2,2,1,2,2)

Variables	Coefficients	Standard error	t-ratio	P-value
FDI	13.10795	3.305255	3.965790	0.0041
IRD	-0.027062	0.067279	-0.402234	0.6980
TAXES	-1.136008	0.394805	-2.877388	0.0206
OTHERS	-11.802996	6.414864	-1.839940	0.1031
EBOLA	-18.98832	4.340349	-4.374837	0.0024
WAR	-11.34453	2.247713	-5.047142	0.0010
C	17.39966	4.639198	3.750576	0.0056
Diagnostic test				
R-square	(0.983599)	Serial correlation (LM Test)		(0.7845)
Adjusted R-Squared	(0.971572)	Heteroscedasticity		(0.6400)
Normality Test (Jacque-Bera)	(0.856630)	Joint significance (F-Statistics)		(14.70540)

*Source: Author's computation (EViews 12) Note: ***, **, * denotes 1%, 5% and 10% significance levels respectively*

From the result in Table 5 above it shows that foreign direct investment (FDI), direct tax and other taxes are the most significant variables that affect the GDP in the long run. Ideally, the result establishes a positive relationship between the foreign direct investment and the economic growth, and the variable is statistically significant at the 5 percent level. Thus, a percentage increase in the foreign direct investment will increase the economic growth by 13.10793 percentage point at the conventional level of significance. Therefore, the finding is consistence with the priori expectation. Theory also affirms that there is positive relationship between the foreign direct investment and economic growth which is the dependent variable.

Similarly, both the interest rate and direct tax as a percentage share of the GDP are negatively related to the GDP and its variables are statistically significant at the 5 percent level, except the interest rate deposit that is not significant at the 5% significance level. Thus, a percentage decrease in each of the sector would automatically lead to a decrease in the economic growth by -0.027062 and -1.136008 percentage point at a conventional level of significance respectively.

Short-Run Dynamics Coefficients based on SIC-ARDL (1,2,2,2,1,2,2)

Estimation results in Table 6 reveal that there is a negative relationship between the economic growth and the foreign direct investment in the short-run, which is significant at 5 percent level in the short-run. The coefficient of the Agricultural sector reveals that there is a negative relationship in the short run. Hence, any further adverse effect on the foreign direct investment would lead to a decrease in the economic growth.

From the Table 6 above you can also notice that other tax has a negative relationship with the economic growth in the short run. Hence, it is significance at 5 percent level in the short-run. This is due to the fact that availability of alternative sources of fund will make government to relax their endeavour of mobilizing domestic revenue in the form of tax.

The coefficient of interest rate shows a positive relationship that exists between the interest rate deposit and the economic growth. This actually remains to be significance at 5 percent level but only in the short run.

Table 6: Short Run Dynamic Results

Variables	Coefficients	Standard error	t-ratio	P-value
D(FDI)	-6.143259	2.729573	-2.250630	0.0545
D(FDI)(-1)	-19.92825	3.109831	-6.408147	0.0002
D(IRD)	0.234011	0.092887	2.519313	0.0358
D(IRD)(-1)	-0.330884	0.085934	-3.850439	0.0049
D(TAXES)	1.172695	0.523119	2.241737	0.0553
D(TAXES(-1))	0.800551	0.338620	2.364157	0.0457
D(OTHERS)	-6.991813	7.303023	-0.957386	0.3664
D(EBOLA)	-6.948671	2.384392	-.914189	0.0195
D(EBOLA(-1))	-13.80343	3.202512	-4.310188	0.0026
D(WAR)	-27.07668	2.362966	-11.45877	0.0000
D(WAR(-1)	-18.29813	2.111428	-8.666233	0.0000
ECT(-1)*	-0.773742	0.105363	-16.83454	0.0000
Diagnostic test				
R-square	(0.983599)	Mean dependent var.	(0.041209)	
Adjusted R-Squared	(0.971572)	S.D. dependent var.	(13.18082)	
SE Regression	(2.222378)	Akaike info criterion	(4.736135)	
Sum of squared residuals	(74.08443)	Schwarz criterion	(5.312062)	
Likelihood	(-51.93782)	Hannan-Quinn criterion	(4.907388)	
Durbin-Watson stat	(2.132688)			

*Source: Author's computation (EViews 12) Note: ***, **, * denotes 1, 5 and 10 percent significance levels respectively*

The short-run estimates also show that the Error Correction Term (ECT (-1) *) is negative and statistically significant at 1 percent level. The implication of this is that, the convergence process to long-run equilibrium is at an adjustment speed of 77.37%. That is, the error in the current year will be corrected in the coming years at a speed of 77.37%, which simple means that, in a very high speed of adjustment to long-run equilibrium.

In a nutshell, the value of the R-Squared is 0.983599, implying that approximately 98% of the variation in the economic growth (GDP) model is explained by the independent variables which is an indication of a good fit. The overall model is statistically significant as shown by the probability value of the F-Statistic (0.005879).

Diagnostic and parameter stability tests

By evaluating the statistical properties of the model in the long run, a battery of test was performed. This is to ensure that the model does not suffer from serial correlation, heteroscedasticity, and normality problems.

Serial Correlation

The null hypothesis cannot be rejected as the probability value is greater than the conventional 5 percent requirement of no serial correlation in the model. Thus, the model if free from serial correlation as shown in the Table 7.

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Table 7: Serial correlation LM test

F- statistic	0.080734	Prob. F (1,7)	0.7845
Obs*R-squared	0.307854	Prob. Chi-Squared (1)	0.5790

Source: Author's computation (EViews 12)

Heteroscedasticity Test

The estimated model passes the test for heteroscedasticity test based on the regression squared residuals on squared fitted values. The heteroscedasticity test below shows the p-value of about 0.2460 which is approximately 25% more than the critical value of 0.05 or 5 percent. Thus, the model is homoscedastic.

Table 8: Test for heteroscedasticity

F- statistic	0.843402	Prob. F (18,8)	0.2460
Obs*R-squared	17.68212	Prob. Chi-Squared (18)	0.4768
Scaled explained SS	1.365388	Prob. Chi-Squares (18)	1.0000

Source: Author's computation (EViews 12)

Normality Test Result

The model also passed the normality test based on the Jarquer-Bera value of 0.237453 and the probability of 0.888050 which is above the required 5 percent level. Thus, the residuals are normally distributed across observations as shown in the figure 4.1

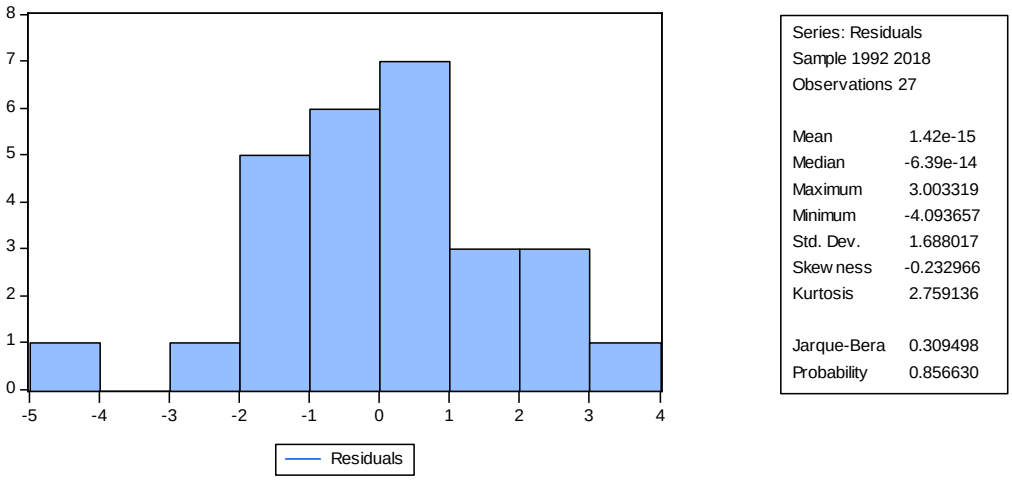

Figure 2: The Jarque-Berra Normality Histogram for the ARDL model
Source: Author's computation (EViews 12)

Stability Test

The stability of the regression coefficients is evaluated using the Cumulative Sum of (CUSUM) and the Cumulative Sum of Squares (CUSUMSQ) test for structural stability (Brown et al,1975). The test results on both the CUSUM and CUSUMSQ test reveal that the regression equation appears to be stable, as the test statistic lies within the 5 percent critical bound as shown in figure 2 and in figure 3 below.

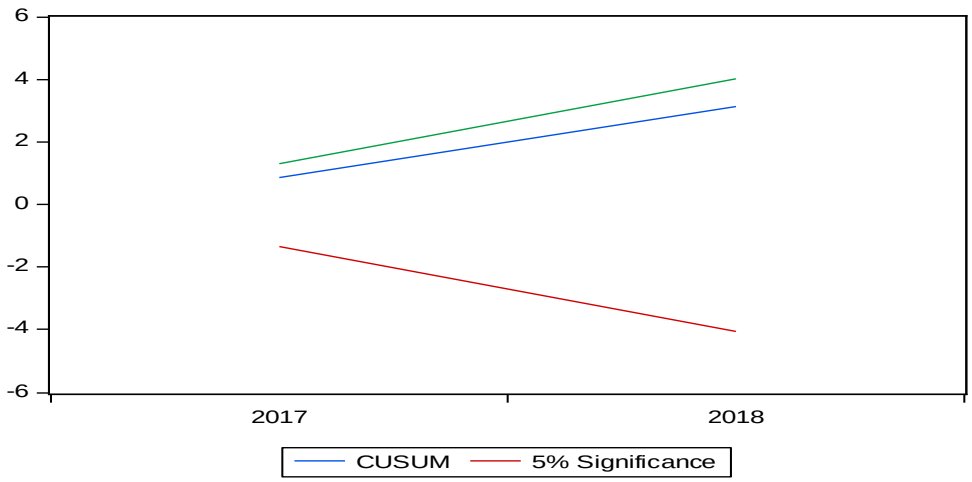

Figure 3: Plot of Cumulative Sum Recursive Residuals
Source: Author's computation (EViews 12)

The straight lines represent the critical bounds at the 5% significance level

Figure 4: Plot of Cumulative Sum of Squares Recursive Residuals
Source: Author's computation (EViews 12)

The straight lines represent the critical bounds at the 5% significance level

Conclusion

Tax revenue is important for any country since it enables the country's government to cater for the welfare of her people. In addition, a country that mobilizes adequate tax revenue reduces her budget deficit which translates into reduced external borrowing. Reduced external borrowing is good for economic growth since the amount of country's revenue which could be used in paying the external debt can be employed in other productive sectors of the economy. This in turn will assist the country to reduce the level of unemployment as well as attracting foreign direct investment. Higher tax revenue occurs as a result of high tax rates and a large tax base. However, according to Laffer curve, tax

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revenue increases as tax rates increase up to a certain level beyond which it starts to decline.

Sierra Leone has embraced many tax reforms in indirect taxes for instance, moving from sales tax to VAT. With regard to direct taxes, various reforms have been embraced for instance, introduction of PIN, withholding tax and the reintroduction of GST. However, these reforms are not based on a robust analysis of the effect of each form of tax on Sierra Leone's economic growth. This is because understanding of the weight each tax head on country's economic growth will guide the tax policy makers on where to focus much.

The research is being made a careful selection of the control variables in addition to indirect taxes, direct taxes and other taxes as guided by empirical studies in this line of study. These variables were analyzed using econometric techniques as guided by Gujarati (2004) and other international studies in the field of study. The explanatory variables used in the study are indirect taxes, direct taxes and other taxes. To achieve the intended objective, pre-estimation tests and Stationarity tests were carried out. Augmented Dickey Fuller test was used to test for presence of unit root. The results showed that all variables were non-stationary at levels. Other taxes, interest rate, FDI were revealed to have one unit root. GDP and direct taxes showed presence of two-unit roots since they became stationary at first differencing. These attributes of the data informed the researcher to identify the lag length and also check for cointegration using Johansen test of cointegration. Five criteria (LR, FPE, AIC, HQIC and SBIC) for identifying lag length were used of which all recommended 4 lags. Johansen test of cointegration revealed presence of six cointegration equations.

After identification of the number of lags and cointegration equations the study proceeded to estimation of VECM which takes into account both short run and long run causality. The coefficient of the error correction term (ECT) was negative and significant at 1 % level of significance. This therefore implied that there was long run relationship running from, direct taxes, other taxes, interest rates and FDI to GDP. The results revealed overall significance of the explanatory variables in explaining GDP. The coefficient of determination showed that 98.4 percent of the variation in GDP is explained by the variables in the model.

The findings further revealed that lag one of GDP, lag one of direct taxes, lag of other taxes, lag one of FDI and lag one on interest rate to be important in determining economic in Sierra Leone. The results showed that the coefficient of lag one of GDP to be positive and significant at 5 percent in influencing economic growth in Sierra Leone. The coefficients of lag one and lag of other taxes were revealed to be negative and significant at 5 percent in influencing economic growth in Sierra Leone. Further, the coefficients of lag one of FDI and lag one of interest rate were found to be positive and separately significant at 5 percent in influencing economic growth in Sierra Leone.

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