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The Link Between Tax Revenue Components and Economic Growth: Evidence from South Africa. An ARDL Approach

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Abstract

The aim of this study is to examine the link between tax revenue components and economic growth in South Africa, utilizing time series data for the period of 22 years (1994-2016). The stationarity of the variables was established using the Phillips-Perron (PP) unit root test, and the existence of long-run and short-run equilibrium conditions was tested using the Autoregressive Distributed Lag (ARDL) model. As a proxy for economic growth, the study used the real GDP growth rate (RGDP) as the dependent variable, with Company Income Tax (CIT), Personal Income Tax (PIT), taxes on International Trade and Transactions (ITT), taxes on income, profits, and Capital Gains Tax (CGT), Foreign Direct Investment (FDI), Inflation (INF), and Gross Savings (SAV) as the independent variables. According to the PP findings, none of the variables are integrated at a higher order than one, i.e., (1). All variables are found to be cointegrated, and all explanatory variables have a long-run link with economic growth. According to the ARDL findings, CIT, PIT, and taxes on ITTs all have a positive long-run and short-run link with economic growth, whereas CGT, FDI, and SAV have a negative long-run and short-run link with economic growth. The long-run coefficient is negatively related to RGDP, while the short-run coefficient revealed a positive link between INF and economic growth, among other findings. Heteroskedasticity and autocorrelation are not present in our model, according to diagnostic tests. The Cumulative Sum (CUSUM) and Cumulative Sum of Squares (CUSUMSQ) values indicate that the model is structurally sound.

Keywords: *Tax revenue, Foreign Direct Investment (FDI), Inflation (INF), Gross savings, Economic growth, Autoregressive Distributed Lag (ARDL) model*

1. Introduction

The link between tax revenue and economic growth has long been a source of contention in public finance and macroeconomics. However, many questions remain unanswered, and the empirical link between taxes and growth appears to be far more complex than theoretical findings suggest. Some studies discovered a strong link (Skinner, 1987; King and Rabelo, 1990; Arnold *et al.*, 2011). Helms (1985) investigated the impacts of raising state and local taxes. He contends that tax increases may stimulate growth if used to fund development costs, whereas Dowrik (1992) and Saibu (2015) found that taxation has a strong adverse effect on economic growth. In contrast, Roshaiza *et al.* (2011) found that

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changes in taxation have no effect on economic growth in their study. In its most basic form, tax is a monetary payment made by the public to the government in exchange for services provided indirectly to the public by the government (Ahmad and Sial, 2016). It is also seen as a required payment given by people and organizations to fulfill government expenses (Dandago and Alabede, 2001). Taxation is critical in a developing country like South Africa for promoting long-term growth and poverty reduction. Governments, according to Hijazi (2001), use taxes to increase the state's economic and productive efficiency by monitoring and fully exploiting economic resources.

The primary goal of taxation is to fund public expenditures and redistribute wealth, which translates to funding the country's development. The best way to design a tax system depends on a variety of factors and varies from country to country. It is critical to understand how different taxes distort and harm economic growth in order to design effective tax systems (Nantob, 2014). According to various studies, raising consumption taxes while lowering labor and capital taxes can stimulate the economy's growth forces. According to economic theory, taxes (except for lump sum taxes) cause distortions, which have a negative impact on economic growth. According to Fjeldstad (2013), an efficient tax system is critical for long-term development as it can mobilize the homegrown revenue base as a vital tool for developing nations to liberate from aid or reliance on a single natural resource. Whether the taxes collected are sufficient to finance the country's development will depend on the country's necessities, and countries might seek alternate sources of revenue to finance long-term development (Unegbu and Irefin, 2011). In order to achieve economic growth and fiscal consolidation, tax efficiency, particularly the tax structure, is critical. According to Naiyeju (1996), the success or failure of any tax system is determined by how well it is administered and how well the tax legislation is understood and applied.

South Africa undertook a reform of its inherited tax system after obtaining democracy in 1994. That was an once-in-a-lifetime opportunity to create a tax structure appropriate for a market economy. The major goal of the reform was to create a neutral tax system, that is, a tax system that interferes as little as possible in the economic behavior of economic subjects, hence assuring economic efficiency and prosperity. The National Treasury (Department of Finance) in South Africa develops the tax policy framework, and it collaborates closely with the South African Revenue Service (SARS) to ensure that tax policy and tax administration is effectively matched. The laws that the Commissioner must enforce govern South Africa's tax system. The most notable of these are the Income Tax Act 58 of 1962, the VAT Act 89 of 1991, and the Customs and Excise Act 91 of 1964.

South Africa's economy is heavily reliant on tax revenue as a source of government expenditure for development. Personal Income Tax (PIT), Corporate Income Tax (CIT), and Value-Added Tax (VAT) generate the majority of national tax collections. A fair and equitable tax system is a pillar of South African democracy, reflecting the principles of social solidarity enshrined in the country's constitution. One of the primary issues that a developing country like South Africa faces is a lack of tax revenue. SARS has, on the other hand, played an important role in the development of the democratic state by ensuring that projected levels of revenue are available to support expenditure programs (Budget Review, 2017). South Africa has a taxation system based on residency. Residents are taxed on their whole income, regardless of where it was earned, subject to specific exceptions. Non-residents are only taxed on income earned in South Africa, subject to relief under Double Taxation Agreements (DTAs). Foreign taxes are deducted from the South African tax due on foreign income.

In comparison to other emerging nations, South Africa suffers an overabundance of difficulties, including high unemployment, growing economic and social inequality, sluggish economic growth, high public debt, and low Foreign Direct Investment (FDI). Instead of declining, the unemployment rate has risen from 17% in 1994 to 26.7% in 2016 (Statistics South Africa, 2017). In 2014 (HSRC, 2014), the country's Gini coefficient, which measures income inequality, was reported to be 0.63, making it one of the highest in the world. South Africa's debt-to-GDP ratio was 50.7% in 2016, according to Budget Review (2017), up from 27.80% in 2008. In 2015, the GDP growth rate was 1.3%, up from 0.3% in 2016.

The purpose of this paper is to provide a better understanding of revenue growth by uncovering numerical values and determining its influence on South African economic growth. The question of particular interest is whether South Africa's revenue generation capacity is sufficient to support output growth. Aside from government expenditure, one aspect of public sector economics that has received a lot of attention is the economic impact of government tax collection on economic growth. The link between tax revenue and economic growth has long been a contentious topic in the public finance literature, having a complicated link (Dackehag and Hansson, 2012). Whereas, Takumah (2014) argues that the role of taxation in prompting economic growth is of long-standing interest to academics as well as economic policymakers and tax professionals.

In light of this motivational contextual, the purpose of this paper is to assess the role of tax revenue in contributing to South Africa's long-term growth. The study used a conceptual method to investigate the revenue pattern in post-apartheid South Africa and assess its impact on GDP growth. Policymakers, international financial institutions, and

academics will benefit from the conclusions of this study. First, the findings will aid us in determining if tax revenue has an impact on South Africa's economic growth. Second, the findings will provide policymakers with information on the long-term impact of tax policy on economic growth. This may influence their fiscal and monetary policies in the future. Finally, the research will add to the body of knowledge about the link between tax revenue components and economic growth in South Africa.

2. Literature Review

Solow (1956) provides an open study on the link between taxes and economic growth. Taxes have no influence on steady state growth, but income tax has a detrimental impact on economic allocation, according to his new classical growth model. Solow went on to say that tax policy has an impact on economic growth because it discourages new investment and entrepreneurial rewards, distorts investment decisions, and discourages work effort and workers' skill acquisition.

There have been many empirical studies conducted to determine the link between economic growth and taxation. However, the results of these studies are often contrary. Some studies have found that taxes have aided in improving the economy's performance, while others have found that taxation reduces output and thus economic growth, and still others have found little evidence to support a strong link between taxation and economic growth.

Takumah (2014) used quarterly data from 1986 to 2010 to investigate the impact of tax revenue on economic growth in Ghana using the VAR framework. According to the findings, there is a short-run and long-run link between tax revenue and economic growth. The findings also revealed a one-way causation between tax revenue and economic growth. The findings validate that tax revenue has a positive and statistically significant influence on economic growth in both the long and short run, demonstrating that tax revenue boosts Ghana's economy. Along the same lines, in his study, Sekou (2015) used the Ordinary Least Square (OLS) approach to estimate the parameters and discovered that the log population on log volume of trade had a positive and significant coefficient. He claims that in Mali, there is a link between tax collecting and growth. Arisoy and Unlukaplan (2010) look at how the mix of direct and indirect taxes affects economic growth. They use the Feeder Model to extract time series data for the Turkish economy from 1968 to 2006. To confirm the significance, in-between direct and indirect taxes they discover that indirect taxes are positively and significantly correlated, with economic growth. Finally, they argue that if economic growth is to be boosted, the fraction of indirect taxes should be higher than the share of direct taxes. Arnold *et al*. (2011) concluded that moving the tax base from consumption to property would have a favorable influence on economic growth by analyzing yearly data for 21 OECD nations from 1971 to 2004 and applying an Error Correction Model (ECM). Using pertinent descriptive statistics and econometric analysis, Ogbonna and Ebimobowei (2012) investigate the impact of tax reforms on economic growth in Nigeria. They discovered that diverse tax reforms are connected to economic growth in a favorable and substantial way, and that tax reforms generate economic growth.

Some research, on the other hand, show a negative link between taxation and economic growth. In a research, Saima *et al.* (2014) used Johansen's cointegration tests for data estimation and time series data for empirical analysis from 1973 to 2010. They discovered that high taxes in Pakistan have adverse implications on consumption, investment, and, ultimately, GDP. Lee and Roger (2005) used a regression model with cross-country data to investigate how tax policies impact economic growth rates between 1970 and 1997. According to the study, lowering the corporate tax rate by 10% would increase annual growth by one or two percentage points, implying that corporate taxes have a negative impact on economic growth. Saibu (2015) used the model proposed by Scully (2003) for Cote D'Ivoire and discovered that in Nigeria and South Africa, there is a negative association between tax burden and rate of economic growth. Anne (2014) found a negative but insignificant influence of income taxes on the Kenyan economy using OLSs, Unit Root tests, Johanssen Cointegration Test, and Vector Error Correction Model (VECM) in her own study. Another research, conducted by Yaya (2013), using the Branson and Lovell (2001) linear programming-based approach, Data Envelopment Analysis (DEA) for New Zealand, and found that higher taxes are linked to lower economic growth. Margareta and Åsa (2012) used fixed effects regression on a panel data set of 25 OECD nations from 1970 to 2010 and found that both company and PIT had a negative impact on economic growth. In addition, Njogu (2015) used a Poisson regression model to investigate the impact of value added tax revenue on economic growth in Kenya from 1990 to 2014. According to the study, every unit loss in tax revenue results in a 7% rise in the impact rate of GDP. As a result, it can be inferred that in Kenya throughout the study period, there is a considerable negative association between tax revenue and GDP.

Some research yielded varied findings. Keho (2011) uses the Autoregressive Distributed Lag (ARDL) technique to examine the link between various taxes and output in Cote d'Ivoire from 1960 to 2006. The study's findings show that, with the exception of Real GDP (RGDP) and direct taxes, all variables are cointegrated in the long term. Except for direct taxes, all taxes have a positive correlation with economic growth. The change of direct taxes into indirect taxes, as suggested by a policy recommendation research, is one way to boost economic growth. Similarly, Umoru and Anyiwe (2013) investigate the impact of Nigeria's tax structure on economic growth. They used empirical estimation methods such as cointegration and error correction, as well as an empirical disaggregation approach. They discovered that direct taxes has a significant and positive correlation with economic growth, but indirect taxation has a moderate negative influence.

Other studies have found no evidence of a substantial link between taxation and economic growth. Taha *et al*. (2011) utilize time series data from 1970 to 2009, including 40 observations, to examine the link between government revenues and economic growth in Malaysia. They looked at the short- and long-run causal relationships between these two variables. The findings reveal that there is a one-way relationship between economic growth and tax collections. Changes in taxes have little effect on economic growth, but increased economic growth boosts tax collections.

The studies above revealed that the link between taxation and economic growth varies by country. Overall, the majority of studies concluded that taxation is associated with positive economic growth, with only a few studies finding no conclusive evidence to support these hypotheses. It is inappropriate to make any generalizations about the potential link between economic growth and taxation in the context of South Africa based on these mixed results. What is clear is that, while different combinations and magnitudes of taxes have different effects on real activities, there is a clear and significant relationship between tax revenue and real economic activity.

Regressions of the OLS model, cointegration, and ECM are chosen and utilized as statistical methods in the majority of studies. Other statistical approaches, such as ARDL and the VAR model, were also used in several research. Finally, most of the publications offer a bigger sample of nations, with the majority of them focusing on Asia and Africa.

3. Methodology

3.1. Data and Source

This research is structured to make use of time series data. In essence, this enables the researcher to determine the impact of various tax revenue components on economic growth in South Africa from 1994 to 2016. All the data were obtained from the South African Reserve Bank (SARB).

Table 1: Summary of Variables and Expected Signs of Their Coefficients

Variables Explanations	Variables Symbols	Expected, A Prior
Real GDP growth rate	RGDP	+ (positive)
Company Income Tax	CIT	+ (positive)
Personal Income Tax	PIT	+ (positive)
Taxes on International Trade and Transactions	ITT	+ (positive)
Capital Gains Tax	CGT	+ (positive)
Foreign Direct Investment	FDI	+ (positive)
Inflation as a GDP deflator	INF	+/- (positive/neg)
Gross Savings	SAV	+ (positive)

3.2. Model Specification

The model will be built using empirical evidence showing tax revenue variables have a beneficial impact on South Africa's economic growth. As a result, the model specification's functional form will be:

$$RGDP_t = (CIT_t + PIT_t + ITT_t + CGT_t + FDI_t + INF_t + SAV_t) \quad \text{... (1)}$$

The variables are then represented as follows in their linear form:

$$RGDP_t = \beta_0 + \beta_1 CIT_t + \beta_2 PIT_t + \beta_3 ITT_t + \beta_4 CGT_t + \beta_5 FDI_t + \beta_6 INF_t + \beta_7 SAV_t + u_t \quad \text{...(2)}$$

Equation (2) is written as follows in the context of a log-linear model:

$$RGDP_t = \beta_0 + \beta_1 lnCIT_t + \beta_2 lnPIT_t + \beta_3 lnITT_t + \beta_4 lnCGT_t + \beta_5 lnFDIt + \beta_6 lnINF_t + \beta_7 lnSAV_t + u_t \quad \text{...(3)}$$

β_0, is intercept, β_1 to β_7 are the slopes of the independent variable coefficients to be determined, and u_t is the error term at time *t*.

To determine the short-run and long-run links between the tax revenue variables of interest and economic growth, we use the ARDL bounds testing technique developed by Pesaran *et al.* (2001). The ARDL approach has the benefit of handling integer or fractional order of integration and does not impose the restrictive premise that all variables under investigation must be integrated in the same order, avoiding the need to evaluate the order of integration of variables. This technique works whether the variables are all I(1) or a mix of I(0) and I(1).

Since ARDL is sensitive to variables that are I(2), this study will first test all of the variables for stationarity, in order to identify the orders of integration of each variable, using the Phillips-Perron (PP) tests of stationarity. Aside from the statistical properties of the ARDL approach, another benefit is that estimations may be performed even when the explanatory variables are endogenous, which is typical in growth models. This, according to Pesaran and Shin (1999), is due to the fact that the model contains the lags of both the dependent and explanatory variables. Finally, this approach works well even with small samples.

Equation 3 is transformed as follows to represent the conditional ARDL economic growth model:

$$\begin{aligned}\Delta lnRGDP_t = {} & \alpha_0 + \sum_{i-1}^{n} \alpha_{1I}\ \Delta\, lnRGDP_{t-1} + \sum_{i-1}^{n} \alpha_{2I}\ \Delta\, lnCIT_{t-1} + \sum_{i-0}^{n} \alpha_{3I}\ \Delta lnPIT_{t-1} \\ & + \sum_{i-0}^{n} \alpha_{4I}\ \Delta\, ln\mathrm{ITT}_{t-1} + \sum_{i-0}^{n} \alpha_{5I}\ \Delta\, ln\mathrm{CGT}_{t-1} + \sum_{i-1}^{n} \alpha_{6I}\ \Delta\, lnFDI_{t-1} \\ & + \sum_{i-1}^{n} \alpha_{7I}\ \Delta\, ln\mathrm{INF}_{t-1} + \sum_{i-1}^{n} \alpha_{8I}\ \Delta\, lnSAV_{t-1} + \beta_1 lnRGDP_{t-1} + \beta_2 lnCIT_{t-1} \\ & + \beta_3\, lnPIT_{t-1} + \beta_4\, lnITT_{t-1} + \beta_5 lnCGT_{t-1} + \beta_6 lnFDI_{t-1} + \beta_7 lnINF_{t-1} + \beta_8 lnSAV_{t-1} + \mu_t \end{aligned} \quad \text{...(4)}$$

where Δ is the first difference operator, the short run and long run elasticities are $\alpha_1, \ldots, \alpha_8$ and $\beta_1, \ldots, \beta_8$ respectively, and u_t is the error term.

Essentially, the ARDL bounds test involves testing the null hypothesis, which specifies no existence of long run link among the variables, that is H_0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = 0$ against the alternative hypothesis of the existence of a long run relationship among the variables, that is H_1: $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq \beta_7 \neq \beta_8 \neq 0$.

In order to inspect the cointegration link between tax revenue components and economic growth, we shall take two stages. To assess if there is cointegration among the variables, we first estimate the above equation using the OLS approach and then compute the *F*-statistic for the null hypothesis H_0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = 0$ versus the alternative that H_1: $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq \beta_7 \neq \beta_8 \neq 0$.

The joint null hypothesis holds in the absence of a long-run level link between tax revenue components and economic growth. The following is how the cointegration test findings should be interpreted: first, if the estimated F-statistic falls between the upper and lower bounds at a given significant level, there is no judgement on whether or not there is cointegration. Second, if the *F*-statistic exceeds the upper bound, the null hypothesis of "no cointegration" is rejected, while the null hypothesis cannot be rejected if it falls below the lower bound. Regardless of whether the underlying orders of integration of the variables are I(0) or I(1), the null hypothesis is accepted.

$$\begin{aligned}\Delta\, lnRGDP_t = {} & \beta_0 + \sum_{i-1}^{n} \alpha_{1I}\ \Delta\, lnRGDP_{t-1} + \sum_{i-1}^{n} \alpha_{2I}\ \Delta\, lnCIT_{t-1} + \sum_{i-0}^{n} \alpha_{3I}\ \Delta\, lnPIT_{t-1} + \sum_{i-0}^{n} \alpha_{4I}\ \Delta\, lnITT_{t-1} \\ & + \sum_{i-0}^{n} \alpha_{5I}\ \Delta\, lnCGT_{t-1} + \sum_{i-1}^{n} \alpha_{6I}\ \Delta\, lnFDI_{t-1} + \sum_{i-1}^{n} \alpha_{7I}\ \Delta\, lnINF_{t-1} \\ & + \sum_{i-1}^{n} \alpha_{8I}\ \Delta\, ln\mathrm{SAV}_{t-1} + \mu_t \end{aligned} \quad \text{...(5)}$$

To estimate the short run coefficients, the long run model is followed by the ECM given in equation 6.

$$\begin{aligned} \text{“}lnRGDP_t = \quad & \beta_0 + \sum_{i-1}^{n} \alpha_{1I}\ \Delta lnRGDP_{t-1} + \sum_{i-1}^{n} \alpha_{2I}\ \Delta lnCIT_{t-1} + \sum_{i-0}^{n} \alpha_{3I}\ \Delta lnPIT_{t-1} \\ & + \sum_{i-0}^{n} \alpha_{4I}\ \Delta lnITT_{t-1} + \sum_{i-0}^{n} \alpha_{5I}\ \Delta lnCGT_{t-1} + \sum_{i-1}^{n} \alpha_{6I}\ \Delta lnFDI_{t-1} \\ & + \sum_{i-1}^{n} \alpha_{7I}\ \Delta lnINF_{t-1} + \sum_{i-1}^{n} \alpha_{8I}\ \Delta lnSAV_{t-1} + \lambda ECM_{t-1} + \mu_t \end{aligned} \quad \text{...(6)}$$

The short run speed of adjustment back to long run equilibrium is measured by the coefficient of the error correction term (ECM), λ. It demonstrates how economic growth deviate significantly from long-run equilibrium but steadily returns to it. As a result, the ECM's coefficient must be less than one, negative, and statistically significant for the economy to reach equilibrium.

We also run the standard diagnostic tests for serial correlation, normality, and heteroskedasticity to confirm that both equations are correct model specification. Finally, we use the Cumulative Sum (CUSUM) and Cumulative Sum of Squares (CUSUMSQ) statistics to test the stability of our estimations.

4. Results and Discussion

4.1. The Unit Root Test

To determine the order of integration of the variables, the PP unit root test is used. The PP compares a unit root's null to the alternative of stationary. The findings in Table 2 demonstrate that none of the variables are integrated at a higher order than one, i.e. I(1), enabling the cointegration test to be used to assess the link between our variables.

Table 2: Unit Root Results

(a) PP Unit Root Test Result

Variables	PP Test Stat	Critical Value	Remark	Order of Integration
lnRGDP	-7.125520	-2.679735*	Stationary	I(1)
lnCIT	-3.729417	-2.679735*	Stationary	I(1)
lnPIT	-2.978720	-2.679735*	Stationary	I(1)
lnITT	-3.819191	-2.679735*	Stationary	I(1)
lnCGT	-3.671000	-.2.679735*	Stationary	I(1)
lnFDI	-4.166858	-2.679735*	Stationary	I(1)
lnINF	-5.418436	-2.679735*	Stationary	I(1)
lnSAV	-4.462865	-2.679735*	Stationary	I(1)

Note: (*) indicate significant at 1%. All the variables are log linearized.

Source: Authors' computation

4.2. Optimal Lag Selection and Cointegration Test Results

Based on the number of regressors included in the growth model, the maximum lag length selected by Akaike Information Criterion (AIC) is 1. As a result, the ARDL growth model obtained is ARDL (1, 0, 0, 0, 0, 0, 1, 0). The cointegration link between tax revenue components and economic growth is tested in two phases. We first use the OLS technique to estimate equation 4 and then calculate the *F*-statistic for the null hypothesis $\alpha_1 = \alpha_8 = 0$ versus the alternative $\alpha_1 \neq \alpha_8 \neq 0$. There is a steady long-run relationship between tax revenue components and economic growth under the interest alternative. Following the bounds test.

Table 3: *F*-Bounds Test

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	5.999656**	10%*	1.92	2.89
K	7	5%*	2.17	3.21
		2.5%*	2.43	3.51
		1%*	2.73	3.9

Note: ** and *denotes significant at 1%, 5% and 10% significance level, respectively.

We reject the null hypothesis of "no cointegration" using the bounds test because the *F*-stat, 5.999656, is greater than the upper bound, I(1), at 1% levels of significance. This demonstrates that all of the explanatory variables have a long-run link with economic growth.

4.3. Long Run and Short Run Analysis

The study estimates the long-run coefficients of the ARDL (1, 0, 0, 0, 0, 0, 0, 1, 0) selected using the Schwarz Bayesian Criterion, based on the existence of a long-run cointegration relationship between tax revenue variables and economic growth. According to Perasan *et al*. (1997), the ARDL-Schwarz Bayesian Criterion and the ARDL estimates have similar small-sample performances, with the ARDL-Schwarz Bayesian Criterion performing marginally better in most of the experiments, which could be due to the fact that the Schwarz Bayesian Criterion is a consistent model selection criterion while the AIC is not.

The short-run and long-run dynamics are integrated in the error correction representation. The short-run reactions of economic growth to the tax revenue and non-tax revenue variables comprised in equation are represented by the coefficients of the variables in the ECM given below (4).

Table 4: Long Run and Short Run Results

Variable	Coefficient	Std. Error	*t*-Statistic	Pro.
Panel 1: Long Run				
lnCIT	3.158911	12.51988	0.252312	0.8092
lnPIT	3.092702	12.55623	0.246308	0.8137
lnITT	0.259048	0.880691	0.294141	0.7786
lnCGT	-3.289935	12.39361	-0.265454	0.7995
lnFDI	-0.140725	0.078098	-1.801894	0.1216
lnINF	-0.003975	0.211966	-0.018754	0.9856
lnSAV	-0.472232	0.405412	-1.164818	0.2883
C	23.76293	17.66351	1.345312	0.2271
Panel 2: Short Run				
Δ*CIT*	5.574453	4.569273	1.219987	0.2682
Δ*PIT*	5.467135	4.626509	1.181698	0.2820
Δ*ITT*	0.590476	0.495952	1.190591	0.2788
Δ*CGT*	-5.726491	4.603348	-1.243984	0.2599
Δ*FDI*	-0.304931	0.086907	-3.508715	0.0127**

Table 4 (cont.)

Variable	**Coefficient**	**Std. Error**	***t*-Statistic**	**Pro.**
Δ*INF*	0.381060	0.129372	2.945458	0.0258**
Δ*SAV*	-0.618831	0.297386	-2.080901	0.0826***
ECM (-1)	-1.553186	0.316810	-4.902574	0.0027***

R^2	0.839401	Mean dependent var	-0.131818
Adjusted R^2	0.759102	S.D. dependent var	1.864298
S.E. of regression	0.915023	Akaike info criterion	2.935552
Sum squared resid.	11.72174	Schwarz criterion	3.332295
Long likelihood	-24.29108	Hannan-Quinn criter.	3.029013
Durbin-Watson stat	2.524905		

Note: ***,** and * denotes significant at 1%, 5% and 10% significance level, respectively.

Without an interaction term between tax revenue components and economic growth, Table 4 shows the ARDL's long and short run relationship. The adjusted R^2, or coefficient of multiple determination, calculated from the above result revealed that the independent variables in the model explain 75.9% of the total variation in the real GDP growth rate.

Furthermore, both the long and short run estimates of Company Income Tax (CIT) in South Africa are positively related to economic growth, implying that a 1% increase in CIT will result in 3.158911 and 5.574453 more than proportionate increases in economic growth in the long and short run, respectively. The outcome matches the a priori expectation. The findings are consistent with Salami *et al.* (2015)'s conclusion Corporate Income Tax is positively connected to RGDP.

The estimated coefficient of PIT is favorably associated to economic growth in both the long and short run. In the long run and short run, a 1% rise in PIT will result in 3.092702 and 5.467135% increases in economic growth, respectively. This corresponds to a priori expectations.

Similarly, in the long and short run, taxes on International Trade and Transactions (ITT) are positively but insignificantly associated to economic growth. This means that a 1% increase on ITT would result in increase in the real GDP growth rate by 0.259048 percent in the long run and 0.590476 percent in the short term, respectively. The findings go in line with a priori expectation.

In contrast, Capital Gains Tax (CGT) has a negative estimated long run and short run coefficients. According to the findings, a 1% rise in CGT would cause the real GDP growth rate to decline by 3.289935 percent in the long run and 5.726491 percent in the short run, respectively. This contradicts a priori expectations.

Moreover, both the long and short run estimates of FDI are significant but negatively related to economic growth, implying that a 1% increase in FDI will result in 0.140725 and 0.304931 decline in economic growth in the long and short run, respectively. The findings go against a priori expectation.

Inflation (INF) has a long-run negative relationship with economic growth. In the long run, a unit rise in INF will result in a 0.003975 decline in economic growth. INF's short-run estimated coefficient, on the other hand, is positively connected to economic growth. In the short run, a unit rise in INF causes an increase in economic growth of 0.381060.

The long and short run estimates of gross domestic saving (SAV) are both adversely connected to economic growth, with the short run estimate being 10% significant. In the long run and short run, a percent rise in SAV will result in 0.472232 and 0.618831 drop in economic growth, respectively. As a result, SAV has no direct effect on South Africa's economic growth. The results go against a priori expectation.

The -1.553186 Error Correction Model ($ECM_{(-1)}$ coefficient had a correct negative sign and was statistically significant at 1%. This demonstrates that a short-run deviation from (0.0027) can be corrected quickly. This conclusion clearly demonstrates that in the short run, the long-run in RGDP (economic growth) is swiftly adjusted to equilibrium. We also discovered that the model's Durbin-Watson value was 2.524905, indicating that there is no autocorrelation in the model.

4.4. Diagnostic Tests

Finally, as shown in Table 5 and Figure 1, the ARDL model passed all diagnostic tests. The model is free of serial correlation and heteroskedasticity, as seen in Table 5. Furthermore, the stochastic residual follows a normal distribution. All necessary diagnostic tests are met by the estimated model. To verify the stability of the variables in the short and long run, the CUSUM and CUSUMSQ tests are used. At a 5% level of significance, the findings are inside the critical boundaries, showing that the model is stable, consistent, and dependable (Figure 1). Over the sample period 1994-2016, the CUSUM and CUSUMSQ plots demonstrate that the long-run coefficients and all short-run coefficients in ECM are stable and drive economic growth (RGDP).

Table 5: Residual Analysis Results

	RGDP	
Tests	**Values**	***p*-Values**
Breusch-Godfrey Serial LM	1.218582	0.2696
Breusch-Pagan Godfrey's Heteroskedasticity	13.18239	0.1545
Jarque-Bera	0.335732	0.845467

Source: Author's Computation

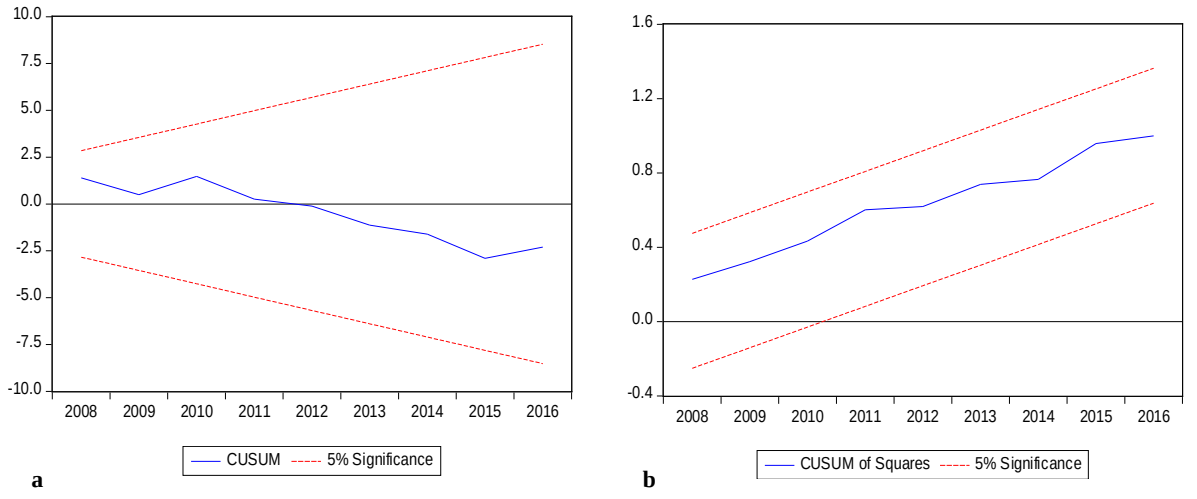

Figure 1: Stability Test: CUSUM and CUSUMSQ

5. Conclusion

The objective of this paper is to examine the link between tax revenue components and economic growth in South Africa for the period from 1994 to 2016. The analysis was carried out using an ARDL model that regressed economic growth on four tax revenue variables and three non-tax revenue variables. The level of integration of time series variables were checked using the PP unit root test. According to the PP findings, none of the variables are integrated at a higher order than one, i.e. (1). All variables are determined to be cointegrated, and there is a long run link between economic growth and all explanatory variables, according to the Bounds Test. The results of the ADRL long and short run analyses point to an inconsistency in the link between various tax components and economic growth.

CIT is positively associated to economic growth in South Africa, according to the ADRL long and short-term estimates, which means that a 1% rise in CIT will result in a more than commensurate increase in economic growth in the long run. In a similar line, the estimated coefficient for PIT is positively associated to economic growth in both the long and short run. In the long run, a 1% rise in the PIT will result in increased economic growth. These two forms of taxes account for a significant portion of South Africa's tax revenue. Furthermore, in the long and short run, taxes on ITT are

positively but insignificantly linked to economic growth. This means that a 1% rise in international trade and transaction taxes would result in RGDP expansion in the long and short run, respectively. The estimated long run coefficient for CGT is, on the other hand, negative. CGT also has a negative estimated short run coefficient. According to the findings, a 1% increase in CGT would constrain the real GDP growth rate in South Africa over the study period.

FDI is adversely and strongly connected to economic growth in the long and short run, and it is statistically significant at 5% in the short run, among other non-tax revenue variable outcomes. In other words, a 1% increase in FDI will result in a 1% drop in economic growth in the long run and a 1% drop in the short run. This suggests that FDI has little influence on South Africa's growth. INF is inversely associated to economic growth in the long run. In the long-run, a unit increase in INF will result in a decrease in economic growth. INF's short-run estimated coefficient, on the other hand, is positively related to economic growth. In the short run, a unit increase in INF will boost economic growth. The long and short run estimates for SAV are both adversely connected to economic growth, with the short run estimate being 10% significant. In the long and short run, a unit increase in SAV will result in a fall in economic growth rate. As a result, SAVs have no effect on the economic growth process.

The lag value of one period of error term that we derive from the long run relationship is the $ECM_{(-1)}$. $ECM_{(-1)}$ should be a negative and statistically significant coefficient. The ECM term's value indicates that the adjustment process is moderate, and 1.553186 of the previous year's RGDP (economic growth) disequilibrium will be addressed in the current year.

Our model is clear of serial correlation and heteroskedasticity, according to diagnostic tests. The distribution of stochastic residuals is normally distributed. Our model is structurally stable, as shown by CUSUM and CUSUMSQ, and lies within the 5% of critical bounds.

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