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AN EMPIRICAL RETROSPECT OF THE CAUSAL EFFECT OF GOVERNMENT EDUCATION SPENDING ON GROWTH IN A NEOCLASSICAL GROWTH MODEL

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Abstract

There has been consensus on the notion that education results in economic prosperity and growth in many countries. This has resulted in a strong focus on education policy, with large investments and a lot of public debates concerning the subject. Various schools of thought have made differing suggestions about how government spending impacts economic growth over the years. The Keynesian view is that there is a positive relationship between government spending and economic growth, where the causal effect runs from government spending to economic growth. Conversely, the Neo-classical school asserts that the relationship between the two variables is negative. The topic, therefore, remains a debatable issue. The impact of government spending on economic growth depends on what it spends its money on. Globally, education is regarded as one of the primary drivers of economic growth. There is no doubt that education is one of South Africa’s to domestic priorities. However, despite the vast literature for developing economies, there seems to be a dearth in the literature on the nexus between government education expenditure on economic growth in South Africa. The present study, therefore, tests the causal effect of education expenditure on economic growth in South Africa for the period 1994 to 2021, with the aid of the autoregressive distributed lag approach and Granger causality test. Consistent with Keynesian theory, the study results confirm the positive impact of government spending on economic growth. A Granger causal relationship exists between government education expenditure and economic growth, indicating that over time, education expenditure positively impacts economic growth through human capital. This implies that investing (spending) in education is critical in promoting economic growth, especially in the long term.

Keywords

Government Education Expenditure, Economic Growth, Autoregressive Distributed Lag Approach, Granger Causality Test, South Africa

1. Introduction

Across the globe, education is considered one of the key catalysts for economic growth. By investing in education, countries can elevate their human resources, thereby boosting economic growth (Suwandaru et al., 2021). Likewise, education receives the greatest share of the South African government spending (5% of GDP), with 21% of non-interest allocations set aside for basic and higher education (National Treasury, 2021). The allocations to the Ministry of Education were increased at an average annual rate of 3.3% from R28.5 billion in 2021/22 to R31.4 billion in 2024/25 (National Treasury, 2022). Total spending on education increased by R80 billion over five years, from R169 billion in 2009/10 to R249 billion in 2013/14 (Odhiambo, 2020).

After decreasing by 0.22% in 2016, public spending on education as a percentage of GDP increased by 15.03% in 2020 (World Bank, 2021). In 2019-2020, South Africa spent more than 20% of its budget on primary and tertiary education, and total education expenditure exceeded 6% of the gross domestic product (United Nations International Children's Emergency Fund, 2019). South Africa's public spending on education as a percentage of GDP increased from 6.5% in 2019 to 6.8% in 2020, an increase of 5.09%.

Despite Finance Minister, Tito Mboweni’s announcement in his 2021 budget speech, that the government would cut spending on education and cultural functions over the next three years, the allocation to the education sector was increasing year by year (National Treasury, 2021). The 2021/2022 budget allocated approximately

R408.2 billion for education. Government spending as a percentage of GDP was reported at 6.84% and 18.42% in 2020 and 2021, respectively (World Bank, 2021).

Education is one of the most important factors contributing to countries' progress, welfare and level of economic and social development (Savrul and Tunc, 2021). It is a crucial factor for sustainable economic growth. Therefore, public expenditures on education are of great interest to both researchers and policymakers (Ziberi et al., 2022). As much as education is important for a country's economic growth, public spending on education is also important for improving education. Public spending on education is therefore expected to affect the country's economic growth.

There has been an increase in interest in Economics literature in studies examining the link between education spending and economic growth (Mercan & Sezer, 2014; Gheraia et al., 2021). However, previous studies have revealed mixed results, especially in countries with different environments and cultures. (Taasim, 2020). Furthermore, despite extensive research on this topic in other countries, little has been done in South Africa. Considering this, this study aims to investigate how government spending on education affects economic growth in South Africa. Furthermore, it determines whether education spending and economic growth are associated in the long term and evaluates short-term dynamics and causal relationships among the variables under study.

2. Literature review

The relationship between government spending and economic growth has attracted the attention of economists, policymakers, and politicians for many years, but the topic is still a debatable issue. As argued by Shkodra, et al., (2022), ''There exists a large body of literature on the impact of government spending on a country's economic growth. However, even though the topic has been investigated extensively, the results are generally contradictory.'' The question is whether the impact of government spending on economic growth is positive, negative, or negligible. As argued by Alqadi and Ismail (2019), "government spending and economic growth remain contentious issues among economists". Different schools of thought have come to different conclusions, where the majority confirm a positive impact of government spending on economic growth (Kimaro et al., 2017; Leshoro, 2017; Lee et al., 2019; Nyasha & Odhiambo, 2019; Olaoye, et al.,(2020). However, others have found a negative impact (Lupu et al., 2018; Onifade, et al., 2020).). There seems to be no study that reveals that government spending has no significant impact on economic growth.

Keynes views government spending as a ladder to economic growth, which encourages short and long-run economic growth (Ahuja & Pandit, 2020; Kgomo & Ratombo, 2022). According to Keynesian theory, government spending has a positive effect on economic growth. The Keynesian theory postulates that the more a country spends, the higher its economic growth will be as a result of expansionary fiscal policy (Riza and Wiriyanata, 2021). The assumption is that when government spending increases, production will follow, stimulating aggregate demand and thereby increasing GDP (Đukić, 2021).

As stated by Ahuja and Pandit (2020), in the Keynesian framework, it is government spending that regulates the rate of economic progression. This perspective overstates the significance of government expenditure and affirms the positive impact of public expenditure on GDP growth. Consistent with this theory, are the studies by Milhana & Nufile, (2019); Ahuja & Pandit (2020); Nuru (2021); Gheraia et al., (2021); Shkodra, et al., (2022).
Inconsistent with the Keynesian school of thought, neo-classical theorists suggest that the relationship between the two is negative. The neo-classical school are of the view that the expansion of government spending leads to the competition of (crowding out) the private sector by increasing domestic interest rates and increasing tax rates with distortionary effects on the allocation of resources. Advocates of this view are amongst others, Kouton (2018); Karaçor et al., (2017; Onifade et al., 2020; Nyasha & Odhiambo, 2019).

According to the Ricardian School of thought (the Ricardian Equivalence Hypothesis), the effect of government spending (whether financed by government debt or tax revenues) on economic growth is neutral. In other words, this relationship between government spending and economic growth does not exist. The main reason behind this neutral effect of government spending on economic growth, according to supporters of the Ricardian view, is consumer expectations about future tax increases. If consumers expect future tax increases, they will increase their savings by reducing current consumption, which in turn neutralizes the government spending multiplier mechanism (Alqadi & Ismail, 2019).

Wagner's law, disagreeing with the Ricardian Equivalence hypothesis that the effect of government spending on economic growth is neutral, postulates that there is a correlation between government expenditure and economic growth, but economic growth causes government spending. Thus, Wagner's Law assumes that economic growth is the cause of the increase in government spending.

Supporters of the Barro view also believe that there is a nonlinear impact of government spending on economic growth. According to this theory, expansion in government spending has a positive effect on economic growth up to a certain threshold, and then the impact will be negative beyond that threshold (Alqadi & Ismail, 2019; Maneejuk, & Yamaka, 2021; Villela, and Paredes, 2022). The study by Yakubu & Gunu (2022) is one of the studies that show that government education expenditure has an insignificant effect on economic growth in both the long-run and short-term, implying that the nexus is nonlinear or neutral.

The relationship between government spending and economic growth has attracted the attention of economists, policymakers, and politicians for many years, but the topic is still a debatable issue. As argued by Shkodra, et al., (2022), „"There exists a large body of literature on the impact of government spending on a country's economic growth. However, even though the topic has been investigated extensively, the results are generally contradictory. Despite the theoretical grounds pointing to a positive relationship between government spending and economic growth, the extant research on this nexus is inclusive (Ahuja & Pandit, 2020).

The impact of government spending on economic growth depends on what the government spends money on and how well the institutional mechanism decides to manage expenditure (Shkodra et al., 2022). Education is regarded as one of the primary drivers of economic progress all around the world. Countries can improve their people resources by investing in education, which can accelerate economic growth (Suwandaru et al., 2021). There is no question that education is one of South Africa's top domestic priorities and the biggest long-term challenge it faces today. Besides, despite the vast literature on developing economies, there seems to be a dearth in the literature on the nexus between government expenditure on education and growth in South Africa. The study by Luthuli (2017) focuses on the impact of education expenditure on education attainment and not economic growth. Conversely, the study by Nkomo (2016) assessed the impact of education and health public spending on economic growth, not solely education spending. This necessitates the need to conduct a study on South Africa.

3. Methodology

3.1 Theoretical framework

The neo-classical production function forms the basis of the model employed in this study. The model by Mallick et al. (2016) is one of the earlier theories which employs a modified version of the Cobb-Douglas production function to examine the link between government expenditure on education and economic growth. According to Mallick et al. (2016). The growth education expenditure model is expressed as follows:

$$\boldsymbol{GDP = f(GEXPE.L, K)} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad \textbf{(1)}$$

Where, GDP represents the total economic growth; and $GEXPE$ represents government (public) expenditures on education. The government expenditure on education (which is a measure of education quantity) represents human capital formation which can make a skilled labour force.

It should be noted that various studies measured education quantity using multiple proxies. L represents labour force, which is measured by total labour force; K is capital, which is proxied by Gross Fixed Capital Formation.

3.2 The Empirical Model

The present study is a modified version of Malick et al. (2016) and Amaghionyeodiwe (2018) in employing the modified Cobb-Douglas function. The model is specified as follows:

$$\boldsymbol{GDP_t = f(GFCF, L, EDEXP, Poverty)} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad \textbf{(2)}$$

The equation can be rewritten as follows:

$$\boldsymbol{L\_GDP_t = \beta_0 + \beta_1 L\_GFCF_t + \beta_2 L\_Labour_t + \beta_3 L\_EDEXP_t + \beta_4 L\_Poverty_t + \varepsilon_t} \ldots \ldots \quad \textbf{(3)}$$

Where, GDP_t represents GDP economic growth, $GFCFt$ is gross fixed capital formation which represents capital.$Labour_t$ represents the workforce, measured by labour force, $EDEXP_t$is the proxy for government education expenditure and $Pverty_t$ $is\ the$ rate of poverty (all for period t).

A Priori Assumption

$\beta_1, \beta_2, \beta_3,$and $\beta_4 > 0$, implying that GDP positively correlates to government fixed capital expenditure, labour, government education expenditure, and poverty rate positively.

Note: All the variables are in logarithm form (represented by L).

3.3 Estimation Techniques

3.3.1 Introduction

This study utilizes the autoregressive distributed lag (ARDL) bounds test approach to determine the long-run and short-run causal effect between government expenditure on education and economic growth. Before the ARDL tests were conducted, stationarity tests were undertaken to check the presence of unit roots in the series. This study uses the Augmented Dickey-Fuller (ADF) and Phillips-Perron tests.

The Granger Causality test is used to determine the significant causal relationship between the variables. The null hypothesis presents that one of the variables in question does not causally affect the other variable in the linear analysis. If both variables do Granger cause (affect) one another; then this is bidirectional causality. However, if it is only one variable that Granger causes (affects) the other, then this is considered unidirectional causality.

Diagnostic tests are conducted to confirm that there are no problems with residuals. This is to check whether the model is proficient or not. This study will test for heteroskedasticity and autocorrelation. Ramsey's RESET (regression specification error test) will be conducted to check for misspecification of the functional form. To test for structural breaks, the Cumulative Sum of Residuals (CUSUM) test and Cumulative Sum of Squares (CUSUMQ) test, as well as the Chow breakpoint tests are used.

3.4 Data Issues

This study employed annual time series data for the period spanning from 1994 to 2021, sourced from the South African Reserve Bank, the International Monetary Fund, and the World Development Bank Indicators. EViews software package was used for analyzing the data as it is a good tool for time series analysis.

4. Empirical Results

4.1 Stationarity tests Results

The Unit Root test is used to ensure that variables are integrated of the same order. It is an important phenomenon for a series to be tested for stationarity since this can influence its behaviour (Ruiters and Charteris, 2020). For this reason, variables were tested for unit root to avoid spurious results and to ensure that no second difference variables exist in our model, as this would violate the ARDL estimator. An augmented Dickey-Fuller test (ADF) was used to test the null hypothesis that a unit root exists in a time series sample. The assumption used in the test for stationarity is that the null hypothesis states that there is a unit root at whatever level of confidence. As such, Table 1 presents ADF results at levels after 1st difference and 2nd difference under the assumption of intercept (constant) only.

		Augmented Dickey-Fuller test			Philips-Perron test		
Order of integration	**Variable**	**Test statistic**	**P-value**	**Implication**	**Test statistic**	**P-value**	**Implication**
Level	L_GDP	-2.960749	0.521	Non-Stationary	-4.555950	0.0013	Stationary
1st difference	L_GDP	-4.931468	0.0027	Stationary	-4.936712	0.0027	Stationary
Level	L_EDEXP	-2.023272	0.2757	Non-Stationary	-2.399992	0.1511	Non-Stationary
1st difference	L_EDEXP	-4.050524	0.0045	Stationary	-4.041426	0.0046	Stationary
Level	L_LABOUR	-2.037960	0.2699	Non-Stationary	-1.911063	0.3225	Non-Stationary
1st difference	L_LABOUR	-6.233955	0.0000	Stationary	-6.330234	0.0000	Stationary
Level	L_GFCF	-2.260518	0.1912	Non-Stationary	-2.260518	0.1912	Non-Stationary
1st difference	L_GFCF	-5.844957	0.0001	Stationary	-6.031491	0.0000	Stationary
Level	L_POVERTY	-2.844434	0.0684	Non-Stationary	-1.16Fund	0.6747	Non-Stationary
1st difference	L_POVERTY	-2.816870	0.0697	Stationary	-2.834064	0.0673	Stationary

Table 1: Stationarity Test

Sources: EViews and Author's compilation

The findings of the Augmented Dickey-Fuller (ADF) test are shown in Table 1. The ADF test was conducted under the null hypothesis (H_0) that the series has a unit root (non-stationary) versus the alternative hypothesis (H_1) that the series is stationary. The ADF test statistics were compared with critical values at the 5% significance level. Accordingly, if the calculated ADF statistic is greater than the critical value at 5%, the null hypothesis that the series has a unit root is rejected and we conclude that the series has no root test; therefore, it is stationary, and vice versa.

The results presented in Table 1 below reveal that all the variables are non-stationary at levels for as the calculated t-statistics in absolute terms are less than the critical values at the 5% level of significance, respectively. However, all variables become stationary after 1st differencing under Augmented Dickey-Fuller (ADF) test. The results also reveal that GDP is stationary at a level under the Philip-Perron unit root test, while all other variables become stationary after the 1st differencing under the Philip-Perron test. As a result, the autoregressive distributed lag (ARDL) approach is employed.

4.2 Autoregressive Distributed lag (ARDL) Bounds test Approach Results

4.2.1 Order selection criterion

Before the ARDL test is conducted, the lag length order criteria test is done to identify the long-run structure and formulate a long-run analysis. Table 2 presents the requisite lag order selection criterion conforming to the selected method applicable to this discipline.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	195.4936	NA	2.61e-12	-15.31949	-15.12447	-15.26540
1	253.8321	93.34154	9.02e-14	-18.70657	-17.73147*	-18.43612
2	279.0247	32.24656*	4.84e-14*	**-19.44198***	-17.68680	-18.95517*

Table 2: Leg length Criteria

Source: Eviews and Author's compilation

According to the results presented in Table 2, by considering the lowest value with an asterisk (*), it is evident that the Akaike Information Criterion value of -19.44198* is less than -17.73147* of the Schwarz Information Criterion and -18.955517* of Hannan-Quinn Criterion. Therefore, this value indicates the best optimal lag for the model as lag 2. Therefore, a chosen criterion should minimise the asterisk figure to determine the best optimal lag.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0,930271	0,261619	3,555825	0,0019
L_GDP (-1) *	-0,036102	0,009915	-3,641009	0,0015
L_EDEXP**	-0,374882	0,111536	-3,361083	0,0030
L_LABOUR**	-0,005345	0,070386	-0,075937	0,9402
L_GFCF**	-0,215359	0,124718	-1,726775	0,0989
L_POVERTY**	0,004547	0,026492	0,171633	0,8654

Table 3: Long-run Coefficients

Source: Eviews and Author's compilation

The rule states that if the calculated F-statistic is lower than the critical value for the lower bound I (0), we fail to reject the null hypothesis that there is no long-run relationship and conclude that there is no cointegration. However, if the F-statistic is greater than the critical value for the upper bound I (1), the null hypothesis that there is no long-run relationship between the dependent variable and its explanatory variables is rejected and we conclude that there is cointegration.

F-Bounds Test		**Null Hypothesis: No levels relationship**		
Test Statistic	Value	Signif.	I (0)	I (1)
F-statistic	8,454950	10%	2,45	3,52
k	4	5%	2,86	4,01
		2,5%	3,25	4,49
		1%	3,74	5,06
Actual Sample Size 27		Finite Sample: n=35		
10%			2,696	3,898
5%			3,276	4,63
1%			4,59	6,368

Table 4: ARDL Bound Test

Source: Eviews and Author's work

From Table 4, the F-statistic value (8, 454950) is greater than the I (1) critical value bound (4.01). Consequently, the null hypothesis that there is no equilibrating (long-run) relationship is rejected, and we conclude that there is a long-run relationship between the dependent variable and its explanatory variables under review.

In interpreting the ARDL long-run results, the signs of the coefficients are reversed, and they explain short-run causal effects. As the p-value of education expenditure (0.0030) is less than 0.05 at the 5% level of significance and for gross fixed capital formation (0,0989) is less than 0.10 at the 10% level of significance, it is therefore, concluded that education expenditure and gross fixed capital formation have short-run causal effects on the gross domestic product (economic growth). However, there is no causal effect running from the labour force and poverty to economic growth in the short run. Therefore, it can be concluded that, in the short-run, education expenditure and fixed capital formation have a positive impact on economic growth (see Table 3).

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.930271	0.125633	7.404703	0.0000
CointEq(-1)*	-0.036102	0.005089	-7.094159	0.0000
R-squared	0,668114	Mean dependent var		0,039089
Adjusted R-squared	0,654839	S.D. dependent var		0,014339
S.E. of regression	0,008424	Akaike info criterion		-6,644195
Sum squared resid	0,001774	Schwarz criterion		-6,548207
Log likelihood	91,69663	Hannan-Quinn criter.		-6,615653
F-statistic	50,32709	Durbin-Watson stat		2,660633
Prob(F-statistic)	0,000000			
* p-value incompatible with t-Bounds distribution				

Table 5: ARDL Error Correction Regression

Source: Eviews and owner's compilation

As expected, the ARDL error correction regression results from Table 5 reveal that the error correction term (ECT), represented as CointEq (-1), has a correct negative sign with an associated coefficient estimate of −0.036102. This implies that about 4% (3.6%) of any movements into disequilibrium are corrected within a year. Furthermore, the p-value of 0.0000, which implies perfect significance, also supports a highly significant long-run causal relationship between the regressand and its regressors.

4 .3 Granger Causality Test

The causality test aims to check how the variables react to each other and the direction of causality between them (Waseem, 2015).

	Obs	F-Statistic	Prob.
L_EDEXP does not Granger Cause L_GDP	26	4,58890	0,0222
L_GDP does not Granger Cause L_EDEXP		0,80533	0,4603
L_LABOUR does not Granger Cause L_GDP	26	0,15910	0,8539
L_GDP does not Granger Cause L_LABOUR		12,1917	0,0003
L_GFCF does not Granger Cause L_GDP	26	0,64793	0,5333
L_GDP does not Granger Cause L_GFCF		1,69566	0,2076
L_POVERTY does not Granger Cause L_GDP	26	3,06233	0,0681
L_GDP does not Granger Cause L_POVERTY		1,55443	0,2347
L_LABOUR does not Granger Cause L_EDEXP	26	0,11909	0,8883
L_EDEXP does not Granger Cause L_LABOUR		3,81246	0,0387
L_GFCF does not Granger Cause L_EDEXP	26	0,03749	0,9633
L_EDEXP does not Granger Cause L_GFCF		0,49553	0,6162
L_POVERTY does not Granger Cause L_EDEXP	26	0,61569	0,5497
L_EDEXP does not Granger Cause L_POVERTY		0,55186	0,5840
L_GFCF does not Granger Cause L_LABOUR	26	2,16953	0,1392
L_LABOUR does not Granger Cause L_GFCF		0,55148	0,5842
L_POVERTY does not Granger Cause L_LABOUR	26	2,11368	0,1458
L_LABOUR does not Granger Cause L_POVERTY		0,65754	0,5285
L_POVERTY does not Granger Cause L_GFCF	26	0,09169	0,9128
L_GFCF does not Granger Cause L_POVERTY		0,45363	0,6414

Table 6: Granger causality tests

Source: Eviews and Author's compilation

Table 6, therefore, provides causality test results between the variables under review. The Granger Causality test results reveal that education expenditure has a long run causal effect on economic growth (GDP) as depicted by the p-value of 0.0222, which is less than 0.05 at the 5% significance level. Thus, the null hypothesis that education does not granger cause economic growth is rejected, against the alternative that it does granger cause education. However, GDP does not lead to education expenditure.

In the case of GDP and labour, causality runs from GDP to labour, not the other way round. This is depicted by the p-value (0.8539), which is insignificant, implying that the labour force does not granger cause GDP, but economic (GDP) growth leads labour force. Regarding gross fixed capital formation and poverty, neither gross fixed capital formation nor poverty granger causes GDP.

4.4 Diagnostic tests

4.4.1 Misspecification Tests

- **Serial (auto) Correlation Test**

Breusch-Godfrey Serial Correlation LM Test:Null hypothesis: No serial correlation at up to 8 lags			
F-statistic	2,19127	Prob. F(8,13)	0,1005
Obs*R-squared	15,50317	Prob. Chi-Square (8)	0,0501

Table 7: Serial Correlation Test

Source: Eviews and Author's compilation

The F-statistic p-value of 0.1005, from Table 7, which is greater than 0.05, implies failure to reject the null hypothesis that there is no serial correlation of any order up to *p*. It is therefore concluded that there is no serial autocorrelation.

- **Heteroscedasticity Test**

The Breusch-Pagan LM test provided a formal test for heteroscedasticity, which tested for the violation of assumption 5, which indicated that the error term should have a constant variance. The heterocedasticity test table indicates that the null hypothesis of no evidence of heteroscedasticity cannot be rejected because Obs*R-squared is greater than the Chi-Square values. Thus, it can be noted that there is significant evidence of homoscedasticity.

Heteroskedasticity Test: Breusch-Pagan-Godfrey Null hypothesis: Homoskedasticity			
F-statistic	1,939502	Prob. F(5,21)	0,1303
Obs*R-squared	8,529447	Prob. Chi-Square (5)	0,1294
Scaled explained SS	8,434828	Prob. Chi-Square (5)	0,1338

Table 8: Heteroscedasticity Test: Breusch-Pagan-Godfrey

Source: Eviews and Author's compilation

From Table 8, since the p-value of the F-statistic (0.1303) is greater than 0.05 at the 5% level of significance, we, therefore, fail to reject the null hypothesis of homoscedasticity (no heteroscedasticity). Thus, it is concluded that the residuals are homoscedastic at the 5% significance level.

- **Residual Normality Test**

The Jarque-Bera test is used to ascertain the normality of residuals within a model.

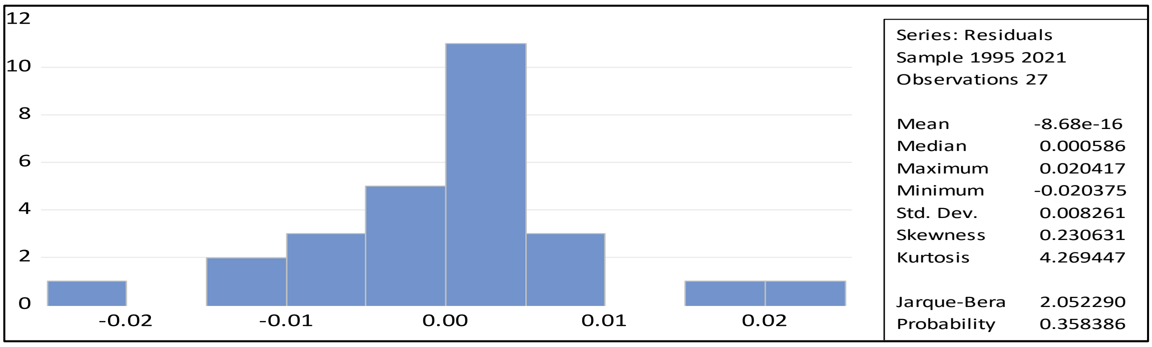

Figure 1 Residual Normality Test

Source: EViews and Author's compilation

Regarding Figure 1 results, the probability value of the Jarque-Bera is 0.358386 and is non-significant at the 5% levels of significance. Therefore, we fail to reject the null hypothesis of the normal distribution and conclude that the residuals are normally distributed.

4.4.2 Stability test

- **Ramsey RESET Test**

The p-value for our F-statistic is 0.5261, which is greater than 0,05 at the 5% significance level implies failure to reject the null hypothesis that the model does not suffer from omitted variables and we conclude that the model is correctly specified (see Table 9).

Ramsey RESET Test Equation: UNTITLED
Omitted Variables: Squares of fitted values
Specification: L_GDAP L_GDP (-1) L_EDEXP L_LABOUR L_GFCF L_POVERTY C

	Value	df	Probability
t-statistic	0,645302	20	0,5261
F-statistic	0,416415	(1, 20)	0,5261
Likelihood ratio	0,556388	1	0,4557

Table 9: Ramsey Reset Test

Source: Eviews and Author's compilation

4.4.3 Testing for Structural Breaks

- **Cumulative Sum of Residuals (CUSUM) test and Cumulative Sum of Squares (CUSUMQ) test**

Finally, the CUSUM and CUSUMSQ plots to check the stability of the long-run parameters and the short-run movements for the ARDL-Error Correction Model are given in Figures 2 and 3, respectively. If the plots of the

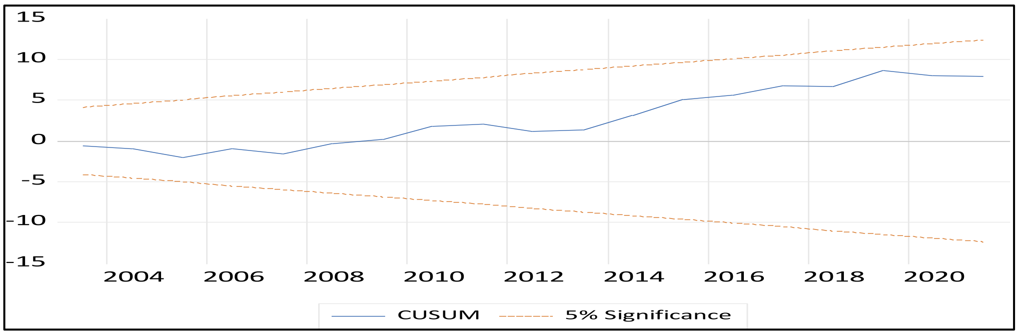

Figure 2: CUSUM test of stability

Source: EViews and Author's compilation

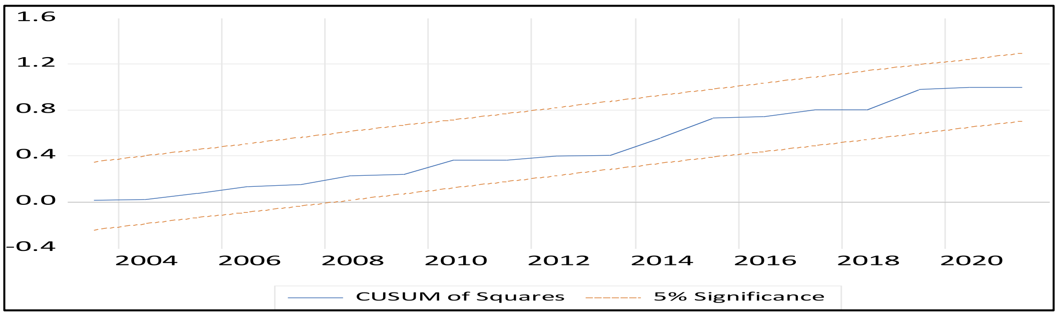

Figure 3: CUSUMQ test of stability

Source: EViews and Author's compilation

CUSUM and CUSUMSQ statistics stay within the critical bounds of a five per cent level of significance, the null hypothesis that all coefficients in the given regression are stable cannot be rejected. Results for plots in Figures 1 and 2 shows that CUSUM and CUSUMSQ statistics are well within the 5% critical bounds, implying that short-run and long-run coefficients in the ARDL-Error Correction Model are stable or the residual variance is stable.

- **Chow Breakpoint Test**

The rule of the Chow breakpoint states that if the value of the F-statistic is greater than 0.05 at the 5% level of significance level, we fail to reject the null hypothesis of no break.

Chow Breakpoint Test: 2015
Null Hypothesis: No breaks at specified breakpoints Varying regressors: All equation variables
Equation Sample: 1994 2021

F-statistic	2.203077	Prob. F (7,14)	0.0988
Log Likelihood ratio	20.79475	Prob. Chi-Square (7)	0.0041
Wald Test	15.42154	Prob. Chi-Square (7)	0.031

Table 10: Chow Breakpoint Test

Source: EViews and Author's compilation

In Table 10, it is evident that the F-statistic (0.0988) is insignificant at the 5% level of significance. Therefore, we fail to reject the null hypothesis, meaning there is no structural break at the chosen period. This is supported by the results of the CUSUMQ test, which reveal that the model coefficients are stable, or the residual variance is stable.

5. Conclusion and Policy Implications

Consistent with Amaghionyeodiwe (2019), the study findings reveal that government spending on education and economic growth in South Africa is positively and significantly related. Long-term Granger causality exists between government expenditure on education and economic growth, indicating that in the long run, government educational expenditure, through its impact on human capital, significantly and positively influences economic growth. This demonstrates that any investment (spending) on education is critical in significantly promoting economic growth, especially in the long term. The results are logical and agree with the Keynesian theory, which postulates that government spending has a positive effect on economic growth.

These results are, however, inconsistent with some previous empirical results. For example, Vijesandran and Vinayagathasan (2014) found a negative long-run association between education and the economic in Sri Lanka. Kouton (2018) also found a negative link between the two variables in Côte d'Ivoire.

The implication is that, as the government invests more funds in education, this tends to boost human capital, which is translated into economic growth in the long run. Therefore, the policy suggestion is that government education expenditure should increase. However, this expenditure must be of quality so it may result in more inclusive growth. In other words, the rate of pupils enrolled in primary education should be high so that not only a high economic trajectory will be achieved but should also results in more inclusive growth. As argued by Kouton (2018: p14), ''what is also important is the efficiency with which education expenditure is translated in education outcomes through better ratios of education".

Finally, policies on education expenditure should be reviewed and updated, which will be advantageous for wealth creation. This would mean that the role of the government would no longer just be to invest massively in education but to set up the economic environment to increase the benefits of education for economic development.

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Contribution/Originality

This study is the first one to investigate the effect of spending on education on economic growth in South Africa, without including other social expenditures like health. The paper's primary contribution is filling the gap in the literature on studies that focus solely on the impact of government and economic growth rate.