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Article

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DEVELOPMENT ECONOMICS | RESEARCH ARTICLE

Impact of government expenditure on economic growth in different states in South Africa

Eugene Msizi Buthelezi^{1*}

Abstract: This paper investigates the impact of long-run government expenditure and economic growth in different states in South Africa. Economic growth has been below the policy target of 5% stipulated in the National Development Plan Vision 2030, while government expenditure growth has been volatile but increasing at a decreasing rate. The paper uses the Vector-error correction (VEC) and Markov-switching dynamic regression with the data from 1994 to 2021. The significance of the paper is that it assesses the short and long-run impacts of government expenditure on different states of economic growth in South Africa. It is found that more government expenditure in South Africa hasn't resulted in the nation's economy growing, which is at odds with the Keynesian viewpoint. In both lower economic states, government expenditure reduces economic growth by 0.009% and 0.30%. The economy is expected to stay for 1 year in state 1, while it is expected to stay for 13 years in state 2. Government expenditure shocks were found to be detrimental to economic growth. It is recommended that fiscal authorities increase government expenditure in the short run rather than in the long run and monitor government expenditure.

Subjects: Macroeconomics; Development Economics

Keywords: government expenditure; economic growth; vector-error correction (VEC) and Markov-switching dynamic regression

Subject: E62; H5; H21; O4



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ABOUT THE AUTHOR

Eugene Msizi Buthelezi holds a BCom degree in economics and finance, master's in economics from the University of KwaZulu-Natal. He is currently in advanced stage to completing a PhD titled impact of fiscal consolidation on government debt and economic growth in South Africa, this research is done at the University of KwaZulu-Natal. Currently, the author is an nGAP Lecturer at the University of Free State teaching economics for public managers at undergrad level. The author's research interest is on the macroeconomics on the aspect of macroeconomic modelling; fiscal policy, consumption; saving; investment; unemployment. Further research interest includes monetary policy in the aspect of monetary theory and policy; monetary systems; inflation; interest rates; central banks and their policies.

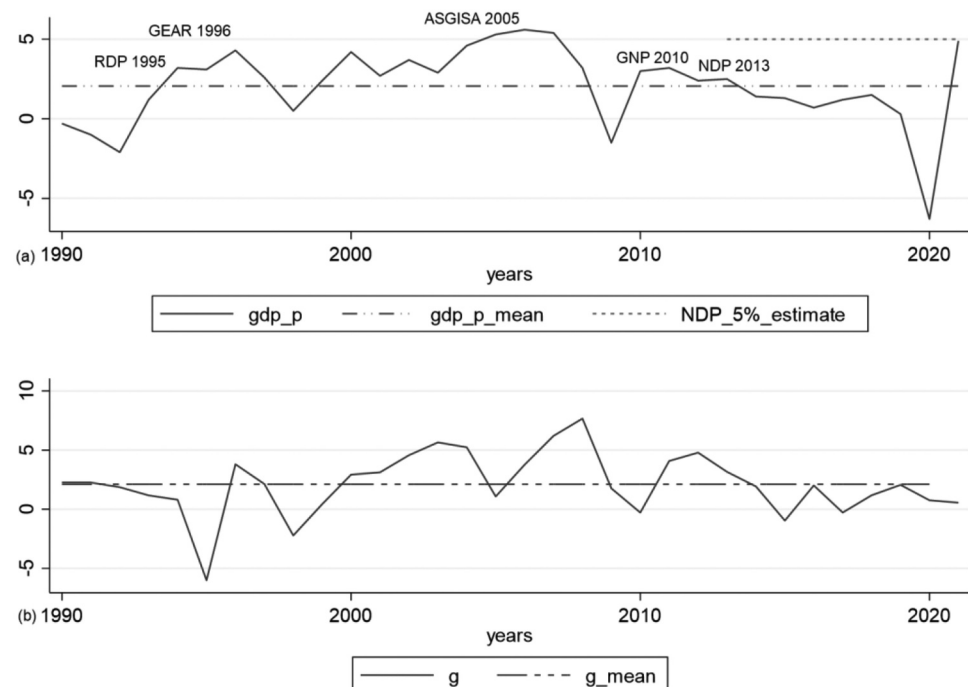
1. Introduction

The investigation of the relationship between government expenditure and economic growth has engrossed extensive consideration over the years as scholars debate. However, there is a lack of consensus among scholars. Gurdal et al. (2021), Shkodra et al. (2022), and Kirikkaleli and Ozbaser (2022), among others, have found that government expenditure has a positive impact on economic growth. Phiri (2019), Onifade et al. (2020), and Hlongwane et al. (2021), among others, have found that government expenditure harms economic growth. At a theoretical level, Keynesians advocate for the positive impact of government spending on economic growth. The Classical view postulates that government spending harms economic growth. Wagner argued that the increase in economic activities is the causal effect running from government expenditure to economic growth. The Ricardian Equivalence model argues that in the presence of a forward-looking agent, government expenditure will not affect economic growth (Badaik & Panda, 2022).

Figure 1 reflects the data of G , which is the government expenditure growth rate, and DGP_P , which is the gross domestic product growth rate from 1990 to 2021. Over the period, the DGP_P recorded an average of 2.06%. This rate is not insufficient to fight other macroeconomic ills, such as unemployment, poverty, and inequalities. SA fiscal authorities have adopted a different economic policy to estimate economic growth. However, DGP_P recorded a lower rate after 3 years of adoption of every policy, while G remains volatile. The G has reflected a slowing since 2013, while DGP_P has been operating below the 5% stipulated in the National Development Plan (NDP). As such another question of the paper is what is the short and long-run impact of government expenditure on economic growth? This question has been explored in SA by Molefe and Choga (2017), Masipa (2018), and Hlongwane et al. (2021). The departure of this paper is that it furthers the question, what is the impact of government expenditure in a different state of economic growth? This is different to the short-run and long-run estimation as the paper further looks to ascertain the impact government expenditure in different states of economic growth. The term “states” in the paper defines lower and higher level of economic growth. On the other hand, given that it is observed that G has reflected high volatility. The G has moved 6 times below the mean and moved 4 times above the mean by 2.11%. The DGP_P has moved 7 times below the mean and moved 4 times above the mean by 2.06%. Therefore, questions are what is the probability of

Figure 1. Economic growth rate and government expenditure growth rate.

Sourced: (SARB 2020).



economic growth moving from state to state? How long will economic growth be in a state? SA *DGP.P* is fragile to macroeconomic shocks reflected in Figure 1 graph a, with four sharps decided that occurred in four episodes. It is in this regard that there is a question on what is the impact of the shock on economic growth? Given the questions of this paper, the hypotheses are as follows:

Hypothesis 1

Null : There is no short and long-run impact of government expenditure on economic growth

Alt : There is short and long-run impact of government expenditure on economic growth.

Hypothesis 2

Null : There is no probability of transition to different regimes of economic growth rate.

Alt : There is the probability of transition to different regimes of economic growth rate.

Hypothesis 3

Null : Time spent by economic growth rate in a state cannot be assented.

Alt : Time spent by economic growth rate in a state can be assented.

Hypothesis 4

Null : Government expenditure shock has no impact on economic growth.

Alt : Government expenditure shock has an impact on economic growth.

The paper is significant because it is important to assess the short and long-run impact of government expenditure in different states of economic growth in SA. This assists fiscal authorities in knowing how to stimulate and control economic activities during different periods. The vector-error correction (VEC) and Markov-switching dynamic regression (MSDR) models are used on time series data from 1994 to 2021. It was found that there is a 0.62% and 0.07% reduction in economic growth for a 1% increase in government expenditure both in the short and long-run, respectively. In both lower economic states, government expenditure reduces economic growth by 0.009% and 0.30%. The rest of the paper has the following. First, in section 2, there is a literature review on empirical studies. Thirdly, in section 3, there is a discussion of the methodology. Fourthly, there is a discussion of the empirical results. Finally, section 5 is the conclusion and recommendation.

2. Literature review

2.1. Theoretical review

The Harrod-Domar model is an economic growth model, which stresses that economic growth is achieved or depends on the level of savings and capital output ratio within the economy (Cypher & Dietz, 2008). Harrod-Domar model is given by $\Delta Y = \frac{S}{I - \delta K}$. Where S is savings, I is investment, δ is depreciation, K is capital and ΔY denotes the change in economic growth or income. The Solow growth model provides the dynamic view of how savings, investment and population affect economic growth reflected by $Y_t = F(K_t, L_t * E) = A(K_t)^\alpha (L_t)^{1-\alpha}$ where Y economic growth, L is labor, K denotes capital, A indicates technological progress and E stands for efficiency of labour which indicates public knowledge about production methods; which is triggered by the improvement in technology denoted by A . The Solow growth model is a dynamic model, and this is denoted

by subscript t in each variable of the model. The exponential subscripts of $1 - \alpha$ is the share of output paid to labour and α is the share of output paid to capital (N. G. Mankiw, 2014, 2019). The endogenous growth theory bridges the gap of the Solow growth model, which assumes that technology is external in explaining economic growth (Rajiv R. Thakur, 2010). Endogenous growth model is expressed by $Y = AK$ where A is a positive constant that reflects the level of technology. It also indicates a constant measure of the volume of output produced for each unit of capital. The subscript K is capital stock, however, unlike in the Solow model where capital K indicated only equipment and fixed or physical capital (N. G. Mankiw, 2014, 2019).

2.2. Empirical literature review

Loizides and Vamvoukas (2005) examining how government spending affects economic development in Greece, the UK, and Ireland revealed that all three nations' public spending increases national revenue over the long or medium term. Mo (2007) investigates how government spending affects actual GDP growth. Government spending was found to have detrimental marginal impacts on both GDP growth and productivity. In specifically, a 0.216% decrease in the equilibrium GDP growth rate is caused by a 1% rise in the percentage of government consumption in the GDP. Gisore et al. (2014) examine experimentally the relationship between government spending and economic development in East Africa between 1980 and 2010. The results demonstrated that spending on military and health had a statistically significant beneficial impact on growth. According to this analysis, East Africa should adopt a strategy of higher health and defense spending to encourage economic growth. Menla Ali and Dimitraki (2014), Markov-switching dynamic regression reflected that increasing government spending is detrimental to economic growth during slower growth–higher growth volatility periods. Chipaumire et al. (2014) investigated the impact of government expenditure and economics in South Africa from 1990 to 2010. It was found that government expenditure resulted to a fall in economic growth. A 1% increase in the government expenditures led to a 6.54% decrease in the GDP. Odhiambo (2015) examined the dynamic causal relationship between government expenditure and economic growth in SA. Using the autoregressive distributed lag model (ARDL), it was found that government expenditure causes economic growth in the short run only and that economic growth causes government expenditure in the short as well as in the long-run, with 89% of the disequilibrium corrected each year. The Generalized Methods of Moments (GMM) was used by Kimaro, Keong et al. (2017) in the fort to look at the effects of government efficiency and spending on the economic growth of low-income sub-Saharan African nations from 2002 to 2015. It has been discovered that raising government spending helps sub-Saharan African nations with low incomes grow economically faster. Sub-Saharan African countries with low incomes should think carefully before utilizing their spending to boost the economy.

Molefe and Choga (2017) investigated government expenditure and economic growth in SA. It was found that government expenditure is detrimental to economic growth. The MSDR of Eid and Awad (2017) was used to investigate the impact of government consumption expenditure on economic growth. It was found that government consumption expenditure in state 1 increased economic growth by 0.04%, while state 2 (the low recessionary state) reduces economic growth by 0.25%. The VEC model was undertaken by Masipa (2018) to investigate government expenditure economic growth in SA. It was found that a 1% increase in government spending will lead to a 0.2% decrease in economic growth.

Phiri (2019) used the logistic smooth transition regression (LSTR) model and found an inverted U-shaped relationship between military spending and economic growth. These results suggest that government military spending increases economic growth. However, government military spending eventually results in a decrease in economic growth. Nyasha and Odhiambo (2019) research has shown that there are grey areas in the relationship between government spending and economic growth. It can be either good or negative, some studies have even found no effect and are inconclusive. Dinh Thanh and Canh (2019) investigated the dynamics between government spending and economic growth using the MSDR mode. It was found that there is an 87%

probability of staying in state 1, while there is an 85% probability of staying in state 2. The government spending changes in state 1 were 0.303% and 0.18% in state two increased in economic growth. L (2020) found an inverted-U-shaped relationship between output growth and government spending. The MSDR model showed that 58% chance of moving from state 1 and returning to state 1. There is a 32% chance of moving from state 2 and returning to state 2. The expected periods of states 1 and 2 were 12 and 16 years, respectively.

Mose (2020), using the EVC model, found that a 1% increase in government spending had a 0.02% negative impact on regional growth. Short-term unidirectional causality between capital, recurring expenses, and growth was found. The absence of a long-run causal relationship connecting growth to expenditure components suggests that macroeconomic measures for economic growth can be undertaken without negatively influencing the level of government spending. Yang (2020) investigated the effect of government expenditure on health on economic growth in 21 developing countries. It was found that health expenditure impairs economic growth by 0.07% in developing countries. However, when the level of human capital is high, there is a positive impact of health expenditure on economic growth. Anisaurrohman, Rizali et al. (2020) found that the government expenditure variable partially does not have a significant effect on economic growth. However, it was noted that an increase in investment and labour experience will affect the increase in economic growth. Anwar, Ahuja and Pandit (2020) employed panel data from 33 provinces and discovered that economic growth increases by 0.15% whenever there is a 1% rise in government spending. Additionally, the spatial Durbin model (SDM) demonstrates that investment and education have a favourable impact on the economic development of nearby regions.

Nartea and Hernandez (2020) analyze a panel of data from 12 provinces to determine the breakdown of government spending on economic growth. It was discovered that government expenditure and economic expansion are positively correlated. The investigation of the impact of productive and nonproductive government expenditure on economic growth was undertaken by Chu et al. (2020) based on OLS fixed effects and the Generalized Methods of Moments (GMM) system approach. It was evident that a 1% increase in productivity, as well as nonproductivity expenditure, increased and decreased economic growth by 0.05% as well as 0.06%, respectively. It was noted that developing economies are shifting government expenditure away from nonproductive government expenditure and toward productive forms of expenditure which is associated with higher levels of growth. Ahuja and Pandit (2020) discovered that there is one-way causality between economic growth and public spending, where the link runs between public spending and GDP growth. Moreover, a 1% increase in government expenditure increases economic growth by 0.002%.

Hlongwane et al. (2021) investigated the impact of government expenditure on economic growth in SA. Using the ARDL model, it was found that a 1% increase in government expenditure in the short-run will significantly increase economic growth by 0.15% in SA. On the other hand, the long-run result reflected that a 1% increase in government expenditure will reduce economic growth by 0.117% ceteris paribus. Mishra and Mohanty (2021) revealed that government expenditure has a favourable and statistically significant influence on economic growth. The Dumitrescu-Hurlin paired causality test demonstrates that there is a causal relationship between government spending and economic growth in both directions. It was emphasized that an expansionary fiscal policy, which involves investing in the productive sector and creating infrastructure, as well as lower interest rates, will assist the country in achieving faster economic growth. Similar to Mishra and Mohanty (2021), Gurdal et al. (2021) found long-run bidirectional causality between government expenditure and economic growth in the G7 countries by utilising time series data spanning the period from 1980 to 2016. It was recommended that public spending should be encouraged in the G7 nations to keep its positive contribution to the growth of these economies.

Shkodra et al. (2022) found support for the positive impact of government expenditure on economic growth. Using OLS, it was found that a 1% increase in government expenditure increases

economic growth by 0.03%. Kirikkaleli and Ozbeser (2022) findings showed that in the long-run, economic growth leads to government spending, while in the short term, especially during recessions, government spending merely serves to boost economic growth.

3. Materials and methods

This paper uses quantitative analysis of economic variables used are *GDP.P* expenditure on the gross domestic product, *AOLR* which is the average output labour ratio, *AOKL* which is the average capital-labour ratio, *HC* household consumption, *G* government expenditure, and *GFCF* gross fixed capital formation. The data are sourced from the SA Reserve Bank (SARB). The models adopted in this paper are the vector-error correction (VEC) and the Markov-switching dynamic regression model (MSDRM) from 1990 to 2021.

The VEC is used because of its advantages, in cointegrating relationships, and long-run parameters are possible. This is not easily achieved in a VAR and OLS. Other scholars that have used the model include Hlongwane et al. (2021), and Kirikkaleli and Ozbeser (2022), among others. The MSDRM is used because it provides attractive transition features over a set of finite states (Hansen, 1996, 2000). This is important because this paper seeks to investigate the long-run impact of government expenditure and economic growth in different states in SA. The MSDRM can reflect the impact in different states given the transition. Other scholars that have used the model include L (2020) and Anwar et al. (2020), among others.

3.1. Theoretical framework

The Solow growth model was first introduced in 1956 and provides a dynamic view of how savings, investment and population affect economic growth (N. Mankiw, 2010; 2012). The Solow growth model is specified in Equation (1).

$$Y_t = F(K_t, L_t * E) = A(K_t)^\alpha (L_t)^{1-\alpha} \quad (1)$$

Where $Y = \text{GDP.P}$ economic growth $L = \text{AOLR}$ is labor $K = \text{AOKR}$ denotes capital A indicates technological progress and E stands for efficiency of labour which indicates public knowledge about production methods, which is triggered by the improvement in technology denoted by A . The Solow growth model is a dynamic model, and this is denoted by subscript t in each variable of the model. The exponential subscripts of $1 - \alpha$ in Equation (1) are the share of output paid to labour and α is the share of output paid to capital. The assumptions of the Solow growth model.¹ In the Solow growth model, it is rationalised that the economy will reach the steady state, which is a value of per capital-capital k^* such that, if the economy has $k_0 = k^*$ then $k_t = k^* \quad t > 1$ (Kung & Schmid, 2015). At the steady state, the Solow model advocates that savings is equal to the amount needed to provide equipment (investment) that is needed for any additional workers n and compensate for depreciation of equipment d given by $sf(k) = (n + d)k$. Since n and d are constant and $f(k)$ satisfies the Inada condition² the consumption is proportional to output $c = (1 - s)f(k)$. The possible choices for s one will produce the highest possible steady state value for c and this is called the golden rule³ savings rate (N. Mankiw, 2010, 2012). However, for this paper, the above Cobb-Douglas method will be extended with other economic variables, such as *HC* household consumption, *G* government expenditure, and *GFCF* gross fixed capital formation reflected in equation (2).

$$\text{GDP.P}_t = \beta_1 + \beta_2 \text{AOLR}_t + \beta_3 \text{AOKR}_t + \beta_4 \text{HC}_t + \beta_5 \text{G}_t + \beta_6 \text{GFCF}_t + e_t \quad (2)$$

Where β is beta and e_t is the $n \times 1$ vector of independent and identically distributed error terms.

3.2. Vector- error correction

The VEC model is built in from the unrestricted vector autoregressive (VAR), as reflected in equation (3).

$$y_t = \beta_0 + \sum_{j=1}^p \beta_j X_{t-1} + e_t \quad (3)$$

Where y_t is an $n \times 1$ vector of the nonstationary $I(1)$ variable, β_1 is an $n \times 1$ vector of constants, p is the number of lags, β_j is an $n \times n$ matrix of estimable parameters, and e_t is an $n \times 1$ vector of independent and identically distributed error terms. The VEC model can handle cointegrated and different economic variables. Therefore, the VAR model is rewritten as the VEC model, as reflected in equation (4).

$$\Delta y_t = \beta_0 + \sum_{j=1}^p \Gamma_j \Delta X_{t-1} + \sum_{j=1}^p \Pi_j X_{t-1} + \gamma_j ECT + e_t \quad (4)$$

Where Δ is the difference operator, and the VECM specification contains information on both the short- and long-run adjustment to changes in X_t via the estimated parameters Γ and Π , respectively.

3.3. Markov-switching dynamic regression

The MSDR is used for series that are believed to transition over a finite set of unobserved states, allowing the process to evolve differently in each state. The transitions occur according to a Markov process, from one state to another, and the duration between changes in the state is random (Hansen, 1996, 2000). The two states can be present in equations (5) and (6).

$$\text{State 1 : } y_t = \mu_1 + \epsilon_t \quad (5)$$

$$\text{State 2 : } y_t = \mu_2 + \epsilon_t \quad (6)$$

where μ_1 and μ_2 are the intercept terms in state 1 and state 2, respectively, and ϵ_t is a white noise error with variance σ^2 . The transition probabilities are shown in a matrix (7).

$$P = \begin{pmatrix} p_{11} & p_{12} \\ p_{21} & p_{22} \end{pmatrix} \quad (7)$$

The theoretical framework outlined in equations (1 to 2) is then extended in the Markov-switching dynamic regression in equation (8).

$$GDP_P_t = \begin{cases} \beta_{11} + \beta_{21}AOLR_t + \beta_{31}AOKR_t + \beta_{41}HC_t + \beta_{51}G_t + \beta_{61}GFCF_t + e_{1t} \\ \beta_{12} + \beta_{22}AOLR_t + \beta_{32}AOKR_t + \beta_{42}HC_t + \beta_{52}G_t + \beta_{62}GFCF_t + e_{2t} \end{cases} \quad (8)$$

4. Results and discussion

Table 1 shows descriptive statistics of economic variables from 1990 to 2022. The GDP_P is found to have a mean of 2.06%. The level of $AOLR$ is found to have an average of 0.59% between 1979 and 2022. The $AOKR$ is found to have a mean of 0.16%. The HC is found to have a rate of 9.90% over the period reflecting the mean. The G is found to be 2.11%, and the $GFCF$ is found to be 8.92% on average.

In as far as the skewness all the economic variables considered are found to have a positive skewness. The kurtosis (being an atheoretical measure of normal distribution) value of 0.9992 suggests that the distribution of $AOLR$ was leptokurtic. That is, it was highly peaked with very thin tail among economic variables considered. Table 2 shows the correlation between economic variables. All the economic variables of interest considered in the paper are found to have positive

correction with *GDP* except *AOKR*. In the variables of interest, the rest *G* has a correlation value of 2.11 with *GDP*.

Table 3 shows the Dickey–Fuller and Phillips–Perron unit test for the economic variables of interest in the paper. Consideration of non-stationary in the data used is important because if no considered the result can be spurious regression leading to misleading coefficient results (Costantini and Martini, 2010). A stationary time series has statistical properties or moments mean and variance that do not vary in time. Most of the economic variables are stationary at level these economic variables on *GDP_P*, and *AOLR*. On the other hand, the economic variables of *D.AKR*, *D.WUI*, and *D.CAPBare* stationary at the first difference or first-order condition.

Mackinnon approximate *p* value for $Z(t) = 0.0280$.

The lag-order selection criteria of (AIC, HQIC, and SBIC) are presented in Table 4. The criteria AIC, HQIC, and SBIC recommend the use of the optimal 3 lag.

The results of the Johansen cointegration tests, in Table 5, show that the null hypothesis for the zero cointegrating equation is rejected at a 0.05 significance level. These results provide evidence that there is a long-run relationship. Therefore, the VEC is relevant for estimation.

Table 6 shows the vector-error correction model results in the short-run and the long-run. In the short-run, it is found that a 1% increase in *LD.GDP_P* in the past year results in a reduction in *GDP_P* in the current period by 0.47%. On the other hand, in the short-run, it is found that a 1% increase in *L2D.G* in the past 2 years results in a reduction in *GDP_P* in the current period by 0.62%. The negative suggests that it is ineffective to stimulate *GDP_P* in the short-run. This can be attributed to ineffective spending, not spending in productive sectors and the corporation that may not be found in the short-run. In the long-run, a 1% increase in *G* results in an increase in *GDP_P* in the current period by 0.07%. This result is similar to that of Hlongwane, Mmutle et al. (2021), and Shkodra, Krasniqi et al. (2022).

Table 1. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis
<i>GDP_P</i>	32	2.0656	2.499498	−6.3	5.6	0.0052	0.0198
<i>AOLR</i>	32	.59509	2.139125	−4.33	4.22	0.2930	0.9992
<i>AOKR</i>	32	.16988	1.969614	−2.33	5.21	0.1897	0.6086
<i>HC</i>	32	9.9049	4.268413	−2.77	21.43	0.6867	0.0300
<i>G</i>	32	2.1106	2.620653	−6.00	7.67	0.1347	0.0471
<i>GFCF</i>	31	8.9263	8.605567	−11.64	26.46	0.9632	0.7486

Table 2. Correlation between variables

Economic variable	<i>GDP</i>	<i>AOLR</i>	<i>AOKR</i>	<i>HC</i>	<i>G</i>	<i>GFCF</i>
<i>GDP_P</i>	1					
<i>AOLR</i>	0.8559	1				
<i>AOKR</i>	−0.2264	0.1823	1			
<i>HC</i>	0.3543	−0.0216	−0.5657	1		
<i>G</i>	0.3051	0.3616	0.2061	−0.0133	1	
<i>GFCF</i>	0.7685	0.6400	−0.1423	0.3904	0.3762	1

Table 3. Dickey–Fuller test for unit root				Dickey–Fuller test for unit root				Phillips–Perron (PP)			
Variable		Test Statistics	1% Critical Value	5% Critical Value	10% Critical Value	Test Statistics	1% Critical Value	5% Critical Value	10% Critical Value		
GDP	Z(t)	−3.886	−3.709	−2.983	−2.623	−3.886	−3.709	−2.983	−2.623		
D.AOLR	Z(t)	−5.487	−3.716	−2.986	−2.624	−5.487	−3.716	−2.986	−2.624		
D.AOKR	Z(t)	−8.280	−3.716	−2.986	−2.624	−8.280	−3.716	−2.986	−2.624		
HC	Z(t)	−3.997	−3.709	−2.983	−2.623	−3.997	−3.709	−2.983	−2.623		
D.G	Z(t)	−4.003	−3.709	−2.983	−2.623	−4.003	−3.709	−2.983	−2.623		
D.GFC	Z(t)	−5.610	−3.723	−2.989	−2.625	−5.610	−3.723	−2.989	−2.625		

Note: Number of obs = 21.

Table 4. Lag-order selection criteria

Lag	AIC	HQIC	SBIC
0	25.8959	25.9815	26.1839
1	22.8071	23.4064	24.8228
2	21.2436	22.3568	24.9872
3	17.3053*	18.9322*	22.7766*

Table 7 reflects the eigenvalue stability condition. The null of no stability in the model is rejected given the results.

Table 8 reflects the Lagrange-multiplier test given that Prob > chi2 suggests that the null that there is autocorrelation at lag order is rejected, and there is a conclusion that there is no autocorrelation at lag order 1 at a 5% p-value.

Table 9 reflects the result of the Jarque–Bera test, which tests for the normality distribution. The probability value of the Jarque–Bera statistic is greater than 5%; therefore, we fail to reject the null hypothesis and conclude that the residuals are normally distributed.

Figure 2 shows the effect of government expenditure shocks on economic variables of interest: economic growth. Figure 2, graph d, reflects that the government expenditure shock on economic growth is detrimental. This is because the shock resulted in a 0.5% fall in economic growth. Thereafter, economic growth increases and returns to equilibrium in year 3. However, after that, economic growth is below equilibrium.

Table 10 reflects the MSDR model from 1990 to 2021. In the first state, estimation 1 of G is found to have a mean of -1.900% . In estimation 4, it is found that a 1% increase in G results in a 0.009% fall in GDP_P . This result is similar to that of Mo (2007) and Chipaumire, Ngirande et al. (2014). This result suggests that it will be detrimental for fiscal authorities to use the expansionary fiscal policy at a time of negative economic growth. As such, it may be recommended that SA move away from the use of international debt to finance government expenditure when economic growth is recording a negative rate. In the second state model, estimation 1 of G is found to have a mean of 2.804%. This state of the economy still has a mean economic growth that is below 5%, which is stipulated in the NDP. As such, this reflects that the SA economy is not yet in a state to resolve other macroeconomic challenges, such as unemployment and poverty. In the second, it is found that a 1% increase in G results in a 0.303% fall in GDP_P .

Figure 3 reflects state 1 to 2 filter transition probabilities and the data of GDP_P . Figure 3 graph a reflects that GDP_P move to state one in two episodes, first in 1994 and second in 2019. This suggests that SA GDP_P is not prone to stay in a negative state. As such, the result reflects that the economy may recover faster in the occurrence of a recession. Figure 3 graph b reflects the filter transition probabilities for state 2, which is characterized by a negative mean of 2.804%. It is found that the economy moved to this state two times. The economy was in state 2 from 1995 to 2018.

Table 5. Johansen tests for cointegration

Maximum rank	Params	LL	Eigenvalue	Trace statistic	Critical value 5%
0	42	−304.73924	.	149.0001	94.15
1	53	−275.80617	0.86404	91.1340	68.52
2	62	−256.01131	0.74466	51.5443	47.21
3	69	−240.33515	0.66078	20.1920*	29.68

Table 6. Vector-error correction model				
Economic variable	Short-run	Economic variable	Long-run	
L_{ce1}	-0.407*			
	(-0.27)			
$LD.GDP_P$	-2.065	GDP_P	1	
	(-1.45)			
$L2D.GDP_P$	-4.280*	$AOLR$	-1.062552***	
	(-2.49)		(0.000)	
$LD.AOLR$	1.349	$AOKR$	0.2075268***	
	(0.98)		(0.000)	
$L2D.AOLR$	4.399**	HC	-0.0332629*	
	(2.62)		(0.038)	
$LD.AOKR$	2.309*	G	0.0759424***	
	(2.00)		(0.000)	
$L2D.AOKR$	2.458	$GFCF$	-0.0511754***	
	(1.54)		(0.000)	
$LD.HC$	-0.478*			

(Continued)

Table6. (Continued)				
Economic variable	Short-run	Economic variable		Long-run
L2D.HC	(-2.06)			
	-0.171			
	(-0.98)			
LD.G	-0.477***			
	(-3.84)			
L2D.G	-0.620***			
	(-3.68)			
LD.GFCF	0.444*			
	(2.29)			
L2D.GFCF	0.179			
	(1.58)			
_cons	0.0350	_cons		-851466

Note: N = 29
*p < 0.05, ** p < 0.01, *** p < 0.001

Table 7. Eigenvalue stability condition

Eigenvalue		Modulus
-.2101073	+1.175174i	1.19381
-.2101073	- 1.175174i	1.19381
1		1
-.2191833	+ .6857053i	.719884
-.2191833	- .6857053i	.719884

Table 8. Lagrange multiplier test

lag	chi2	df	Prob > chi2
1	46.9738	36	0.10419
2	38.6490	36	0.35084

Table 9. Jarque–Bera test

Equation	chi2	df	Prob > chi2
<i>D.GDP</i>	6.505	2	0.03868
<i>D.AOLR</i>	1.143	2	0.56477
<i>D.AOKR</i>	3.578	2	0.16716
<i>D.HC</i>	29.785	2	0.00000
<i>D.G</i>	11.020	2	0.00405
<i>D.GFCF</i>	1.575	2	0.45509
<i>ALL</i>	53.604	12	0.65657

Figure 2. Government expenditure shock on economic variables.

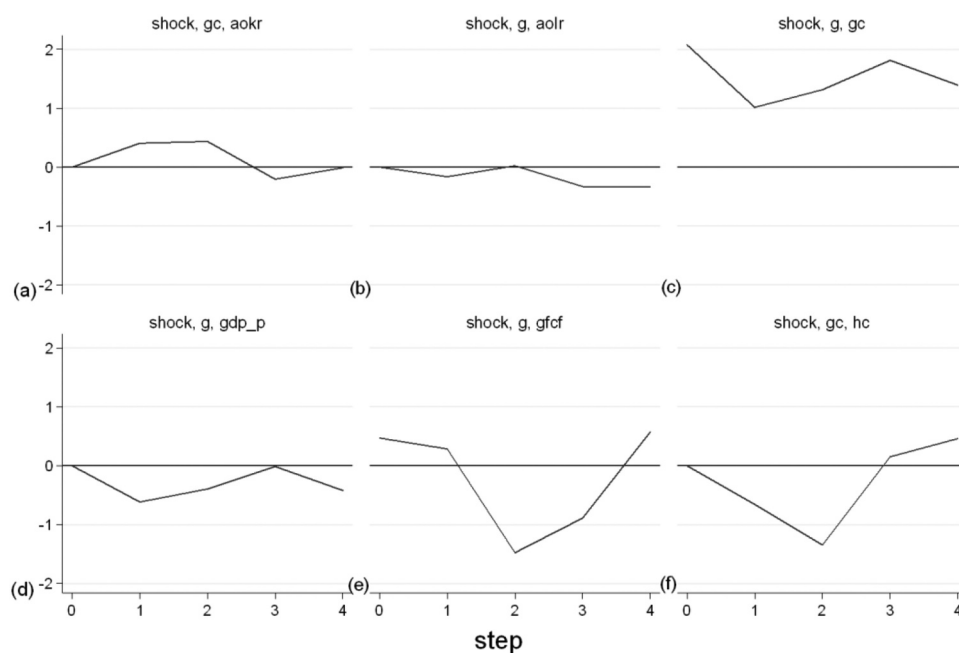


Table 10. Markov-switching dynamic regression

Economic Variables	Estimation			
	1	2	3	4
	<i>GDP_P</i>	<i>GDP_P</i>	<i>GDP_P</i>	<i>GDP_P</i>
<i>AOLR</i>		0.905*** (30.33)	0.888*** (28.63)	0.915*** (34.86)
<i>AOKR</i>		−0.206*** (−7.36)	−0.235*** (−7.62)	−0.206*** (−7.94)
State1				
<i>HC</i>		0.0405** (3.02)		0.0309* (2.54)
<i>GFCF</i>		0.0197* (2.56)	0.0281*** (3.39)	0.0173* (2.32)
<i>G</i>			−0.00486 (−0.24)	−0.00910* (−0.54)
<i>_cons</i>	−1.900* (−1.50)	1.111*** (8.02)	1.473*** (17.24)	1.272*** (9.54)
State2				
<i>HC</i>		0.234** (8.63)		0.297*** (8.63)
<i>GFCF</i>		0.106 (1.91)	0.283*** (4.99)	0.134*** (6.18)
<i>G</i>			−0.405 (−1.08)	−0.303*** (−3.31)
<i>_cons</i>	2.804*** (6.80)	−1.962*** (−4.45)	−0.118 (−0.13)	−1.207 (.)
<i>N</i>	32	31	31	31

Note: t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

The economy moved back to this state from 2012 to 2019. Figure 3 graph c reflects states 1 to 2 for *GDP_P* moving from state to state.

Table 11 shows the transition probabilities of the two states. There is a 92% chance of the economy moving from state one and returning to state one. There is a 100% chance for the economy to move from state two and return to state two.

Table 12 reflects the expected duration to be spent in each state. It is found that the economy will be in state 1 for 1 year. It is expected that the economy will spend 13 years in state 2. These results suggest that a long time will be spent in positive economic growth.

5. Conclusion and policy implications

The objective of this paper was to investigate the short- and long-run impacts of government expenditure on economic growth. Economic growth has been below the desired by SA policy. The question of the paper was what is the impact of Molefe and Choga (2017), Masipa (2018), and Hlongwane, Mmutle et al. (2021) government expenditure in a different state of economic growth? The vector-error correction (VEC) and Markov-switching dynamic regression (MSDR) models were used. It was found that there is a 0.62% and 0.07% reduction in economic growth for a 1% increase in government expenditure both in the short and long-run, respectively. This is confirmation of the relational of the Classical view which postulates that

Figure 3. State 1 to 2 filter transition probabilities and *GDP_P*.

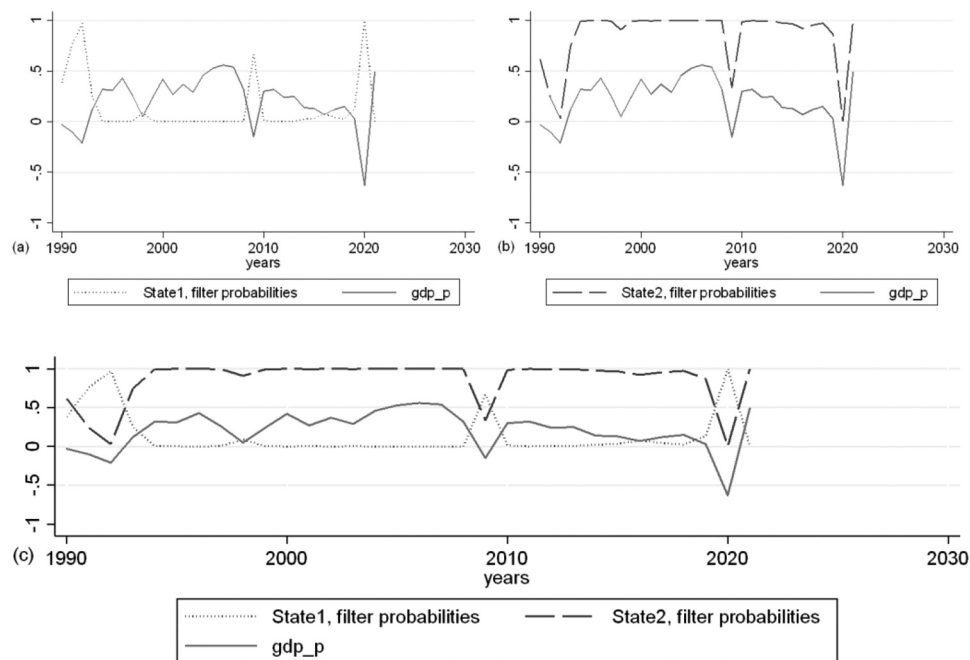


Table 11. Transition probabilities

Transition probabilities	Estimate	Transition probabilities	Estimate
p_{11}	0.9231075	p_{21}	1.73e-20
p_{12}	0.0768925	p_{22}	1

Table 12. Expected duration

Expected duration	Estimate
State1	1
State2	13.00517

government spending harms economic growth than the Keynesians advocate. The findings may provide an overview of policy suggestions to improve the effects that government expenditure has on economic growth. Given that government expenditure is found to be detrimental on economic growth, it is advised that the South African government restructure its expenditure to be directed in productive sectors of the economy in the effort to achieve macroeconomic goals for economic growth. It is recommended that the government increase the effectiveness of its public programs and service delivery in order to reduce the wastage of the limited economic resources. There is a 92% chance of the economy moving from state one and returning to state one. It is recommended that fiscal authorities increase government expenditure in the short-run rather than in the long-run. This is because, in the short-run, there is a small negative effect in the long-run. Moreover, the government needs to ensure that there is monitoring and evaluation of government expenditures. Government expenditure needs to be directed to projects that will stimulate economic growth. In the effort to have more insight on the impact of government expenditure on economic growth it is recommended that future studies look at the effect of fiscal decentralization. This will allow fiscal authorities to have an understanding of what is the impact of government expenditure on economic growth at a local level.

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Notes

1. This assumption include: (1) Perfect Competition, (2) Closed Economy, (3) Saving equals investment, (4) There is perpetual full employment of labour, (5) There is exogenous technical progress, (6) Diminishing returns to capital, (7) There are constant returns to scale, (8) Capital depreciates at the constant rate, (d) and (9) Population grows at a constant rate, (n).
2. The Inada condition are assumptions about the shape of a production function that guarantee the stability of an economic growth path in a neoclassical growth model.
3. The Golden rule is the steady state with the highest level of consumption and is denoted by, (k_{gold}^*) .

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