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-RESEARCH ARTICLE-

EFFECTS OF GOVERNMENT INVESTMENT AND CONSUMPTION SPENDING ON ECONOMIC GROWTH IN SOUTH AFRICA: A FURTHER DISAGGREGATION USING ARDL APPROACH

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Abstract

This study was prompted by South Africa's recent infrastructural backlogs and stagnant economic growth, exacerbated by low economic growth rates and insufficient infrastructure investment. Earlier research assessed the impact of aggregated government spending on economic development using a variety of methodologies and time intervals. However, the current study explores the effects of further disaggregated government investment expenditure on education and health, government consumption spending on defense and social protection, and other control variables on South Africa's economic growth. The period 1983–2020 is covered by annual time series data, and auto-regressive distributed lag (ARDL) and error correction mechanism (ECM) approaches are utilized. The effects of government expenditure on education on short- and long-term economic growth are mixed, but investment in health has a considerable beneficial influence in the long term. Similarly, depending on the component, government consumption expenditure has various effects on short- and long-term economic growth. The study indicates that government expenditure boosts economic growth in South Africa and makes policy suggestions based on these findings. The spheres of government will be able to establish and alter economic development policies that will deliver the required economic growth following the South African agenda of radical economic transformation as a result of these findings. To increase productivity, the report suggests

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that the government invest more in building an effective educational plan and maintaining and enhancing the quality of education.

Keywords: ARDL, economic growth, Error Correction Model, government spending, investment

JEL Classification: E31, E62, H51, H52

1. INTRODUCTION

The effect of government spending on economic growth has been studied for many years, and related research has helped to predict future economic expansion. Since the Keynesian revolution (Keynes, 1936), government spending has been regarded as a crucial exogenous policy instrument with a favorable effect on the growth and development of any global economy. On the one hand, Wagner (1958) proposed a "law of expanding state activity," which states that government economic initiatives and responsibilities increase because of economic growth, which leads to an increase in government spending.

Because the South African government has significantly increased its spending in many sectors of the economy, while economic growth remains relatively modest, this study was inspired by this reality. Thus, the current study investigates the applicability of Keynes's theory to South Africa and departs from prior research by examining the effects of further disaggregated government expenditure components of consumption and investment. While previous studies in South Africa either observed the impact of aggregated government spending or disaggregated it into investment and consumption, the current study aimed to examine the effects of government spending on education and health (investment) and defense and social protection (consumption) on economic growth, thus adding to the body of ongoing research.

South Africa's financial system has fostered substantial expansion in education, social grants, health, and community development over the years (Treasury, 2018a). Researchers have questioned whether increases in government spending positively impact economic expansion. On the influence of government spending on economic growth, previous research by Landau (1986), Kormendi& Meguire . (1985), Grier & Tullock. (1989), Barro (1990), and Romer (1990) is negative or lacks consensus. However,their conclusions contradict Ram (1986) and Carr (1989), who established through empirical research that the expansion of government was positively correlated with economic growth.

Differences in experimental approaches, model parameters, and time durations contribute significantly to these contradictory outcomes. The current investigation considered these conflicting findings. The technique tried to support or refute a Keynesian theory about South African government spending. Moreover, it tried to close the knowledge gap by employing rigorous and dependable testing techniques. This is the

first study to assess the effects of progressively disaggregated government investment and consumption spending components on the South African economy.

There has been substantial disagreement in the academic literature regarding the effect of government spending on economic growth - a question that continues to be of crucial importance among scholars, policymakers, and economists worldwide (Balaj&Lani, 2017; Leshoro, 2020). Several studies demonstrate that an increase in South Africa's government spending has mitigated the consequences of the global financial and economic crisis (Kumo, 2012; Treasury, 2018a).

1.1. An Overview of the South African Economy

The South African economy suffered between 1960 and 1990 due to the country's increasing isolation from international collaboration. Due to the country's lack of access to foreign education and training institutions, it was practically impossible for the nation to engage in technical advancements or international marketplaces. The fall in government investment from 27% of GDP in 1981 to 15% in 1993 had a detrimental impact on economic infrastructure, including rail transit, ports, and power supplies (Department of Planning, 2014). The government was also faced with a high rate of inflation (15%) and large capital outflows (Department of Planning, 2014).

Figure 1 illustrates the varied performance of South Africa's GDP. During the 1980s, South Africa had numerous government shifts alongside political and economic instability. The new constitution adopted in 1983 includes the bicameral legislative system and the notions of own and universal affairs. In addition, the violent protests of 1985 and 1986 led to the declaration of a state of emergency and the escalation of economic restrictions in the mid-1980s. From the 1980s to the 1990s, the agricultural industry also experienced change's "ups" and "downs." The GDP growth rate gauges the rate of economic expansion. From 1980 through 1994, the GDP increased by only 1.2% each year. This was exacerbated by negative GDP growth from 1990 to 1992. Since 1993, the South African economy has grown continually; the country has contributed to positive GDP growth rates, higher living standards, well-being, and access to economic infrastructure for its population (Department of Planning, Monitoring, and Evaluation (Department of Planning, 2014).

The trajectory of GDP growth fluctuated for some time until it reached a negative point in 2008. (-1.5 per cent). Two years after the global financial crisis of 2008, the country's average GDP growth increased by 4.7%. Beginning in 2011, countries' GDP grew at a slower rate. Large economies in developing nations grew slightly slower than those in developed nations. The South African economy has struggled to achieve growth rates above 2% and has remained exposed to a sluggish global recovery and internal issues.

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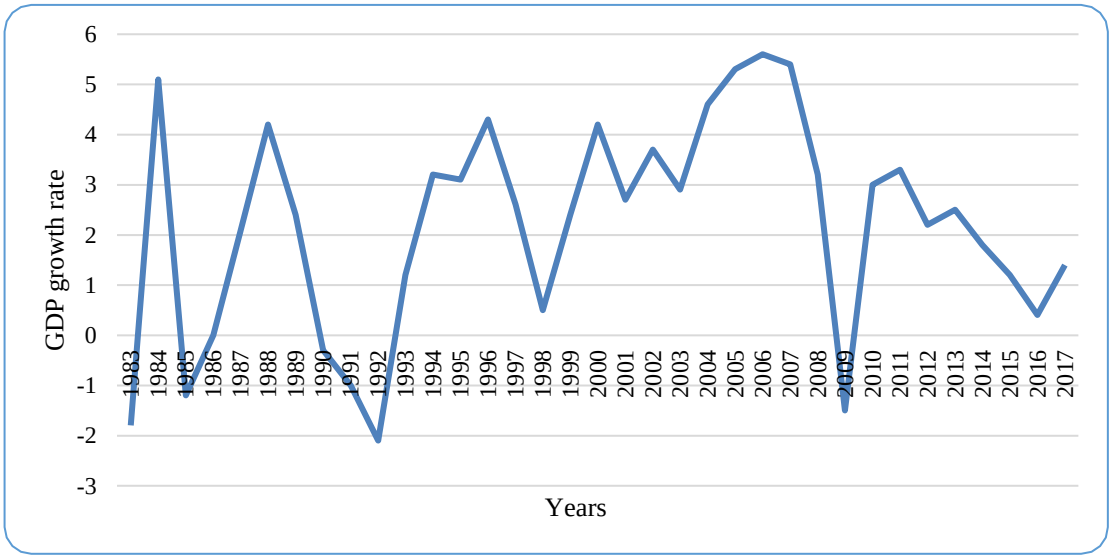

Figure 1. GDP growth rate in South Africa: 1983–2017

This has led to poor economic growth rates, a decline in GDP per capita, high unemployment, a decline in savings and investment, and stagnating formal sector employment ((FFC), 1998). Inadequate investment in infrastructure and financial restrictions to balance infrastructure backlogs and sluggish development posed further difficulties for the nation. These obstacles diminished the quality of service delivery and increased the resources required to maintain existing infrastructure (Treasury, 2011).

The economy expanded by 2.5% in 2012 but dropped to 2.2% and 1.2%, respectively, in 2013 and 2014. Since January 2015, the International Monetary Fund (IMF) has revised its growth rate prediction for South Africa for 2015 (from 2.1% to 2.0%) and 2016 downward (from 2.5 percent to 2.1 percent). This prognosis of decreased growth was precipitated by internal issues, which had a greater impact on economic growth than global economic trends. Mining, quarrying, and manufacturing industries have made the most unpredictable contributions to GDP growth, historically the sectors most influenced by demonstrations. An increasingly constricted electricity supply has also hindered growth; emergencies in electricity supply deficits began in 2007 and were declared formally in 2008 and again in early 2014 (FFC, 2016/2017). In 2016, South Africa's gross domestic product (GDP) grew by 0.4%, a decrease of 0.8% from 2015, whereas in 2017, it grew by 1.4%. The chief contributors to this expansion were the agriculture and mining industries.

The end of apartheid and the emergence of democratic democracy in the 1990s resulted in a rise in government spending since the new administration sought to speed up the delivery of social services to the black population, which had been neglected for years. In a challenging global climate, the government implemented policies in 1994 that restored and maintained macroeconomic stability. Among these was the introduction of

fiscal policy to stimulate the economy. Government spending is regarded as one of the most important fiscal instruments utilized to achieve macroeconomic objectives, resulting in a substantial boost in GDP. Odo et al. (2016), who conducted a study in South Africa from 1980 to 2014, determined that the only answer to the economic growth problem was government expenditure outlays directed at achieving fundamental macroeconomic goals.

1.2. Research Objectives

The study's main objective is to examine the impact of disaggregated government investment and consumption spending on economic growth in South Africa from 1983 to 2017. The specific research objectives are as follows:

1. To empirically examine the impact of each component of the disaggregated government investment and consumption spending on economic growth in both the long- and short-run.

To test Keynes's theory's applicability, determining whether disaggregated government investment spending and government consumption spending positively affect economic growth.

The remainder of this study is structured as follows: the next section presents the theoretical and empirical studies on government spending and economic growth. Since the income or government multiplier is not part of the current study, it is thus excluded, section three focuses on the methodology, followed by the discussion of results, and section five provides the conclusion of policy recommendations.

1.3. Significance of the Study

The public sector economy requires an understanding of the effect of government expenditure on economic growth and the trends and direction of its growth. The increasing level of government spending, low economic development rates, and insufficient infrastructure investment to balance infrastructure backlogs and growth that the South African economy has seen in recent years prompted this study. The purpose of this study is to give an updated empirical examination of the impact of disaggregated government investment and consumption spending on South Africa's economic growth from 1983 to 2020. The study evaluates the effects of government investment expenditure on education and health and government consumption spending on defense and social protection on South Africa's economic growth. Disaggregated data refers to the subdivision of aggregated information into smaller pieces to reveal underlying trends and patterns. Since the South African government spent the greatest money on health, education, defense, and social security, it was simple to isolate the variables of interest (Treasury, 2018b). Barro (1991) classified education, health care, and defense spending as productive. Government expenditures on education represent an investment in human

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capital, whereas defense expenditures support the protection of property rights, which increases the probability of receiving the marginal output of capital. Government spending is prioritized to improve health systems and hospitals (Barro, 1991). The study's outcome will enable the government sectors to establish and alter economic development policies to deliver the required economic growth following South Africa's radical economic transformation strategy. Because econometric approaches and descriptive analysis were used to assess the impact of disaggregated government investment and consumption spending components on South Africa's economic growth, the study's findings will be of significant use.

2. LITERATURE REVIEW

The impact of government spending on economic growth is supported by Keynes (1936) theory, which claims that government spending increases aggregate output and generates income. No previous economic theories could explain the reasons for the Great Depression. Thus Keynesian economics was established in the 1930s to do so. In another body of research, Barro (1991) argues that government expenditure will benefit economic growth if it is investment-oriented but has a negative effect if it is consumption-oriented. According to Ram (1986), only government spending on essential areas will positively affect economic growth.

In contrast, public choice theorists claim that if the size of a government expands due to high tax distortions, the government's inefficiency will increase, resulting in a negative impact of government expenditure on economic growth (Christie, 2014). In contrast, according to the neoclassical growth model, government expenditure has no major effect on output since changes in government spending do not induce changes in production. None of those mentioned above accurately predicts the impact of government expenditure or its many components on economic growth.

Several empirical studies have explored the relationship between government spending and economic growth, utilizing various methodological approaches, time frames, and data models. Notably, the results and evidence of these studies differ based on the analytical tools used, the nation of origin, the periods covered, and the model parameters and classifications of government expenditures. Some argue that specific levels of government spending matter and promote economic growth, despite contradictory and contradictory facts.

Existing research has demonstrated the positive, negative, or even insignificant effect of government spending on economic growth. (Aschauer, 1989; Barro et al., 1992; Brons et al., 1999; Dash et al., 2008; Easterly et al., 1993; Fajingbesi et al., 1999; Gramlich, 1994; Grossman, 1988; Holmes et al., 1990; J, 2007; Leshoro, 2020) all found a correlation between government spending and economic growth. Kormendi et al. (1985), Grier et al. (1989), Barro (1991), Romer (1990), Eric M. Engen (1992), Kweka et al. (2000), Fölster et al. (2001), Al-Faris (2002), Akpan (2005), Mitchell

(2005), Olopade et al. (2010), and Olopade et al. (2010)) are examples of empirical studies that found negative or in (2010). Recent empirical studies that identified a positive influence between government spending and economic growth are discussed first, followed by those that found negative and insignificant effects and those that just observed the causal relationship between these variables.

Ram (1986) conducted a study on 115 less developed countries (LDC) and developed nations (DC) using cross-section and time series data from 1960 to 1970 and 1970 to 1980. He found that expansion in government size was positively correlated with economic growth. Diamond et al. (1989) utilized panel data for 42 developing nations in Africa and Asia to assess the relationship between disaggregated government spending and economic development. The variables used were health and education expenditures by the government. The results indicated that spending in these areas had a beneficial impact on short-term economic growth. In addition, the study discovered a correlation between infrastructure and education. Cullison (1993) discovered positive and significant benefits of expenditure on education and labor training on future economic growth in the United States from 1952 to 1991.

In addition, Khosravi et al. (2010) analyzed annual data from 1960 to 2006 using the Auto-Regressive Distributed Lag (ARDL) cointegration method to examine the relationship between government spending and economic growth in Iran. The findings revealed a positive long-term association between the two factors. For the case of Jordan, Dandan (2011) utilized annual time series data for the period 1990–2006. Following the Keynesian theory, the study indicated that the effect of government expenditure on economic growth was positive at the aggregate level.

In addition, Ocran (2011) examined the impact of gross fixed capital formation (GFCF), government consumption expenditure, tax spending, and budget deficit on South Africa's economic growth from 1990 to 2004 using quarterly data. GFCF and government consumer expenditure were found to have a positive and statistically significant impact on economic growth; however, the effect of GFCF was smaller than that of government consumption expenditure. Gadinabokao (2013) empirically examined the relationship between government spending and economic growth in South Africa from 1980 to 2011. The study employed a cointegration and error correction mechanism (ECM), revealing a positive long-term relationship between the two variables of interest. Recent research by Leshoro (2020) validates the findings of (Ocran, 2011) and Gadinabokao (2013) while utilizing the ARDL technique to investigate the influence of government investment and government consumer expenditure on the South African economy. The study used annual time seriesdata from 1976 to 2015. In both the short and long term, disaggregated government spending was positively and strongly correlated with economic growth.

Barro (1991) discovered a negative relationship between government spending and economic growth in 98 developing and industrialized nations using cross-sectional data

from 1960 to 1985. The findings demonstrated that increased government consumer spending was connected with high tax rates, which distorted economic incentives and hindered investment and savings. Using cross-sectional and pooled time series data for 33 sub-Saharan African nations from 1970 to 1990, Ghura (1995) Ghura similarly discovered a negative link between the proportion of government consumer expenditure and economic growth.

Similar negative conclusions were found by Guseh (1997), who analyzed annual time series data for 59 developing middle-income nations from 1960 to 1985. Mitchell (2005) discovered a negative correlation between government size and national income. According to the study, public spending in the United States had expanded exponentially over several years, resulting in significant negative growth. The analysis confirmed that government programs discourage desirable decisions economically. Using quarterly data from 1990 to 2010, Chipaumire et al. (2014) found a negative long-run association between government spending and economic growth in South Africa. This finding contradicts the previously studied studies on South Africa. Akpan (2005), using annual time series from 1970 to 2001, revealed a negligible association between some components of government spending and economic growth in Nigeria. Administrative, financial, capital, recurring, social, and community services and transfers are the selected categories of governmental expenditures.

Okoye et al. (2019) explore the relationship between government spending and economic growth in Vanuatu from 1981 to 2016. The study begins by analyzing the impacts of government spending on economic growth when government spending is paid by tax revenues, non-tax revenues, and budget deficit/surplus. Second, the research explores the relationship between government expenditure compositions and economic growth. The third test examines the poor homogeneity of fiscal factors on investment. The results demonstrate that fiscal considerations and investment influence Vanuatu's economic growth. Specifically, government expenditure harms long-term economic growth when tax revenues finance it. It has a positive effect when funded by other sources, such as non-tax revenues and budget surplus/deficit. The results also indicate that, among expenditure compositions, health expenditures, education expenditures, wages and salaries expenditures, agriculture expenditures, and interest payments expenditures have a greater impact on long-term economic growth than the remaining expenditure compositions.

Olopade et al. (2010) empirically examined the impact of public spending on growth at disaggregated levels for a panel of 30 developing nations from 1970 to 1980. The study concluded that government capital spending had a favorable influence on development, whereas current government expenditure did not affect growth. Government investment in education and overall spending in education were highly correlated with economic growth at the disaggregated level when budget restrictions and deleted variables were considered. Leshoro (2012) examined the effects of aggregate government

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investment spending and aggregate government consumption spending on the South African economy from 1976 to 2015 using the ARDL technique. In addition to other control factors, real GDP growth rate, government consumption, and government investment spending are treated as independent variables. The results indicate that, in the short term, all variables except political rights and inflation are statistically significant in predicting economic development.

Similarly, it reassessed the relationship between government spending and economic growth in South Africa from 1990 to 2015. The variables of interest were GDP, government spending, national savings, government debt, and the Consumer Price Index. The research applied the VECM and Granger Causality methods (CPI). Long-term analysis indicated a negative correlation between government spending and economic growth. Consistent with establishing Wagner's law for South Africa, the Granger causality test found that economic growth and government spending arecausally related. Oladele et al. (2017) used the cointegration approach and VECM to examine the impact of government spending on the South African economy from 1980 to 2014. The findings of the cointegration test indicated a long-term relationship between the two variables. In the long run, the VECM results demonstrated a strong and positive correlation between the two variables. However, the analysis indicated a strong negative relationship between government spending and short-term economic growth.

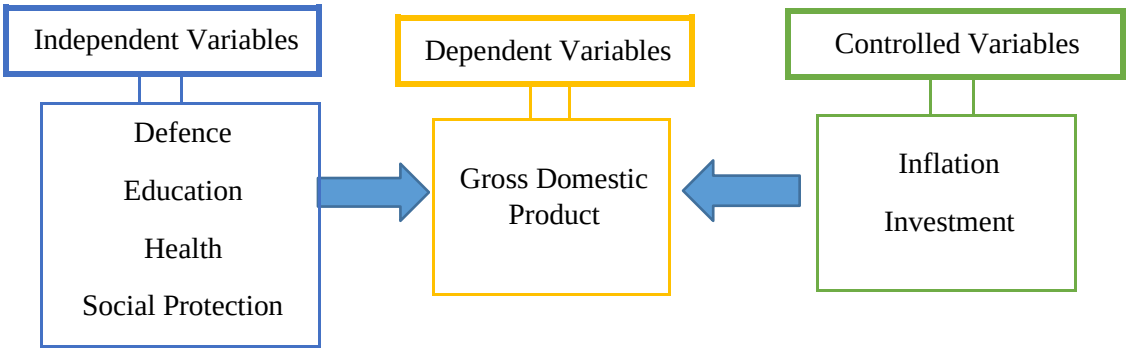
Kimaro et al. (2017) quantitatively evaluated the influence and efficacy of government spending on economic growth in 25 low-income SSA nations from 2002 to 2015. Using the GMM, the results indicated a positive relationship between government expenditures and economic growth in the sample countries. Lupu et al. (2018) analyzed the effect of disaggregated public spending on economic growth in ten Central and Eastern European nations between 1995 and 2015. The study determined, using the ARDL methodology, that public education and health care expenditures positively affect economic growth. In addition, Okoye et al. (2019) examined the aggregate and disaggregated connection between government spending and output growth in Nigeria from 1981 to 2017. The results demonstrate that capital expenditures contribute positively to economic growth. The findings support the positive influence of government spending on economic expansion.

The study by Nyasha et al. (2019) analyzed the influence of government expenditure on economic growth based on a comprehensive evaluation of prior empirical evidence from various nations since the 1980s. The study indicated that the relationship between government spending and economic growth is ambiguous, but that government spending positively influences economic growth. Even though the impacts of government spending on economic growth are unclear, the balance tips favor positive outcomes. Onifade et al. (2020) used annual time-series data from 1981 to 2017 using the ARDL method to assess the impact of government spending on economic growth in Nigeria. While the data demonstrated a considerable negative effect of recurrent expenditure on

economic growth, the association between capital expenditure and economic growth was minor.

Several reviewed research examined government expenditure, while others disaggregated it into two components, consumption and investment, which are becoming increasingly significant. In the meantime, some scholars argued that each element should be further disaggregated and analyzed (Ocran, 2011). Consequently, the present study examines a further disaggregation of each component of government consumption expenditure, namely defense and social protection, and government investment expenditure, namely education, and health, while observing their individual effects on South African economic growth.

1.4. A Conceptual Framework



The study employs GDP as the dependent variable and as a proxy for economic growth. In contrast, government investment, consumer spending, and the control variables inflation and investment are employed as independent variables. Investment is a proxy for the ratio of gross fixed capital formation (GFCF) to gross domestic product (GDP). The dependent and independent variables are calculated in millions of Rand, except the control variables, which are expressed as a percentage, but all variables were translated into logarithmic form.

3. METHODOLOGY

3.1 Data and Model Specification

The current study utilized the autoregressive distributed lag (ARDL) method of econometric analysis to examine the effect of further disaggregated government investment spending on education and health and government consumption spending on defense and social protection on economic growth in South Africa, using annual time series data for the period 1983–2020. The variables of interest, namely government investment expenditures on education and health, and government consumption expenditures on defense and social protection, are only available annually. Although real

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GDP estimates and the control variables, investment, and inflation rate are available on a quarterly and annual basis, the emphasis of the study, disaggregated government spending on investment and consumption, is often available only on an annual basis. For consistency, annual data is utilized in this study.

The variables are selected based on the theoretical foundations of the relationship between government spending and economic growth, growth theories, and past empirical research.

The South African Reserve Bank (SARB) database is the source of annual data on real GDP, the various components of government investment and consumption spending, and investment. The Statistics South Africa (Stats SA) database is the source for annual inflation figures. This study uses real GDP as an indicator of economic growth. It served as the dependent variable, with government investment, consumer spending, and the control variables serving as the independent variables. The independent and dependent variables are calculated in millions of Rand, except for the control variables,which are expressed as a percentage. Thus, all variables were converted to logarithms.

Following the aims of our study, we utilized both the Keynesian model and the Barro (1991). While Keynes (1936) asserts that an increase in general public spending promotes economic growth, Barro (1991) believes that economic growth will be favorably affected if government spending is investment-oriented and negatively affected if it is consumption-oriented. This study indicates, however, that the effects of each component of government expenditure on investment and consumption on economic growth would vary and not strictly adhere to Barro (1991)'s theory. Thus, the predicted association between economic growth and government spending on health is positive. Still, the expected relationship between economic growth and government expenditure on education is either positive or negative. Where education and employment levels are mismatched, a rise in human capital will negatively impact economic development and vice versa. Thus, a positive or negative correlation between education and economic growth is anticipated. People tend to acquire new knowledge and abilities when the workforce is healthy because they anticipate long-term rewards (Bloom et al., 2004). In contrast, if the labor force comprises employees with poor health, productivity drops; this explains the disparities in global growth between regions.Thus, a favorable association is anticipated.

Similarly, economic growth and government spending on defense is negative. In contrast, the relationship between economic growth and government spending on social protection is either positive or negative. According to the threshold research, the association between investment and economic growth is anticipated to be positive, whereas the relationship between inflation and economic growth is either negative or positive (Khan et al., 2001; Leshoro, 2012). Investment is a component ofaggregate demand; increasing investment will enhance aggregate demand and economicgrowth.

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Table 1: Description of the Variables

Description of the variables	Symbol	Explanation	Unit of measure	Source	Reference
Gross Domestic Product at market price	GDP	Refers to the total value of all final goods and services produced within the boundaries of a country in a particular period (one year).	R millions	South Africa Reserve Bank (SARB)	(Leshoro,2017)
Defense	DEF	This is government consumption spending which includes government spending on administration, management, and operation of military, civil, foreign military aid, and (R&D) defense	R millions	SARB	(Khalid et al., 2015)
Education	EDU	This is government investment spending which consists of spending made by the general government on education such as pre-primary, primary, secondary, higher education, and R&D education	R millions	SARB	(Ayeni et al., 2018; Lupu et al., 2018)
Health	HLTH	It is a state of complete physical, mental and social well-being and not merely the absence of disease and infirmity	R millions	SARB	(Lupu et al., 2018; Nasiru et al., 2012)
Investment	INV	It is defined as the value of fixed capital assets (plus stock) produced in an economy over a while. (Controlled variable)	R millions	SARB	(Leshoro,2017)
Inflation	INFL	It is defined as a sustained increase in the general price level of goods and services in an economy over a period (controlled variable)	R millions	SARB	(Ahmed et al., 2015; Chirwa et al., 2016; Leshoro, 2012; Phiri, 2010)

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The model is expressed as follows:

$$GDP = f(EDU, HLTH, DEF, SP, INV \text{ and } INFL) \quad \ldots (1)$$

$$\quad -/+ \quad + \quad - \quad -/+ \quad + \quad -/+$$

where GDP, EDU, HLTH, DEF, SP, INV, and INFL denote economic growth, government spending on education, health, defense spending on defense and social protection, investment, and inflation.

The variables are further expressed linearly as follows:

$$GDP_t = EDU_t + HLTH_t + DEF_t + SP_t + INV_t + INFL_t + \varepsilon_t \quad \ldots (2)$$

Logarithmic form of the model is:

$$InGDP_t = \beta_0 + \beta_1 InEDU_t + \beta_2 InHLTH_t + \beta_3 InDEF_t + \beta_4 InSP_t + \beta_5 InINV_t + \beta_6 InINFL_t + \varepsilon_t \quad \ldots (3)$$

The variables are as earlier defined. β_0 denotes intercepts; β_1, β_2, β_3, β_4, β_5, and β_6 are the coefficients; t is time (annual), and $\boldsymbol{\varepsilon_t}$ is the error term.

3.2 Methods of Analysis

Utilizing the Augmented Dickey-Fuller (ADF) (Dickey et al., 1979, 1981) and Phillips–Perron (PP) (Phillips et al., 1988) methods, stationarity was determined for all variables. In addition, the study applies the ARDL limits testing approach to the cointegration technique established by Pesaran et al. (1995) and Pesaran (2001) to empirically examine the short and long-term correlations between the variables of interest and economic growth. The ARDL cointegration approach is utilized because it offers variousadvantages over other standard cointegration techniques.

According to Ghatak et al. (2001) and Tang (2003), the ARDL Bounds test methodology offers several advantages over the Johansen cointegration method. First, whereas the ARDL efficiently finds the cointegrating relationship for small sample sizes, the Johansen cointegration method is only valid for high sample sizes, as in the present study. Hoque et al. (2010) and Türsoy (2017) indicate further that to conduct the Johansen cointegration method, all variables must be integrated in the same order, I(1). In contrast, the ARDL technique can be applied regardless of whether the regressors are purely I(1), I(0), or a combination of both, but it is inapplicable to variables that are integrated of higher orders (Menegaki, 2019; Pesaran, 2001). However, I must be the dependent variable (1). If the nature of the stationarity of the data is ambiguous, the ARDL Bounds test method is appropriate (Chirwa et al., 2016; Hoque et al., 2010). It indicates whether the underlying variables move together over time (Nkoro et al., 2016). In this work, the ARDL cointegration test model is stated by changing equation 3 (Pesaran, 2001):

$$\Delta InGDP_t = \varphi_0 + \sum_{i=1}^{p} \varphi_1 \Delta InGDP_{t-i} + \sum^{q} \varphi_2 \Delta InEDU_{t-i} + \sum^{q} \varphi_3 \Delta InHLTH_{t-i} + \sum_{i=0}^{q} \varphi_4 \Delta InDEF_{t-i} + \sum_{i=0}^{q} \varphi_5 \Delta InSP_{t-i} + \sum_{i=0}^{q} \varphi_6 \Delta InINV_{t-i} + \sum_{i=0}^{q} \varphi_7 \Delta InINFL_{t-i} + \beta_1 InGDP_{t-1} + \beta_2 InEDU_{t-1} + \beta_3 InHLTH_{t-1} + \beta_4 InDEF_{t-1} + \beta_5 InSP_{t-1} + \beta_6 InINV_{t-1} + \beta_7 InINFL_{t-1} + \varepsilon_t \quad \ldots (4)$$

In equation (4) (Pesaran, 2001), β_1 to β_7 and φ_1 to φ_7 are long and short-run elasticities, respectively. Δ is a difference operator; p and q are the lag lengths and ε_t is an error term.

The null hypothesis is as follows:

$H_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = 0$ (no long-run relationship)

Against the alternative hypothesis:

$H_1 \neq \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta 7 \neq 0$ (a long-run relationship exists)

In addition, the null hypothesis of no long-run association among the underlying variables can be rejected using the ARDL limits testing method if the estimated F-statistic is greater than the upper bound of the crucial values. Likewise, the null hypothesis cannot be rejected if the estimated F-statistic falls below the lower critical values. The result is inconclusive if the F-statistic falls between the lower and upper limits.

Lower and upper bound critical values are based on the assumption that the explanatory variables are integrated of order zero, I(0), and order one, or I(1), respectively. Moreover, under this technique, if cointegration is found, the long- and short-run models of equation (5) (Nkoro et al., 2016; Pesaran, 2001) can be estimated using the standard OLS to determine the speed of adjustment of economic growth back toequilibrium, as well as the short- and long-run coefficients.

The ECM is therefore expressed as follows:

$$\Delta InGDP_t = \beta_0 + \sum_{i=1}^{P} \varphi_1 \Delta InGDP_{t-i} + \sum^{q} \varphi_2 \Delta InEDU_{t-i} + \sum^{q} \varphi_3 \Delta InHLTH_{t-i} + \sum_{i=0}^{q} \varphi_4 \Delta InDEF_{t-i} + \sum_{i=0}^{q} \varphi_4 \Delta InSP_{t-i} + \sum_{i=0}^{q} \varphi_5 \Delta InINV_{t-i} + \sum_{i=0}^{q} \varphi_5 \Delta InINFL_{t-i} + \gamma ECT_{t-1} + \varepsilon_t \quad \ldots (5)$$

In equation (5), γ is the speed of adjustment parameter, and ECT is the error correction term, which measures the short-run speed of adjustment towards the long-run equilibrium. The ECT coefficient must be statistically significant, negative, and less than one. The ECT has a lag of one, which indicates the percentage of the speed of adjustment from a shock in the previous period to the current equilibrium period.

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4. DISCUSSION OF RESULTS

4.1 Descriptive Statistics

Descriptive statistics are used in this study to describe the basic features of the data. The study uses actual data of the variables to measure the central tendency, dispersion, and normality. Table 2 shows the results.

The first two rows of the table display the mean and median values of the series, respectively. In addition, each series's maximum and minimum values are displayed under the column headings maximum and minimum, respectively. The standard deviation is the calculated measure of dispersion around the mean in a series. In absolute terms, the standard deviation is difficult to interpret. However, it can be viewed in relative terms by comparing the standard deviations of two distinct distributions, i.e., the distribution with the smaller standard deviation displays less dispersion.

In comparison, the distribution with the bigger standard deviation displays greater dispersion. GDP has greater mean, median, maximum, and minimum values than the independent variables EDU (education), HLTH (health), SP (social protection), DEF (defense), INV (investment), and INFL (international finance) (inflation). This demonstrates that the GDP has a greater number of extremely large values. In addition, the investment category had the lowest standard deviation, followed by inflation and defense. The skewness, which assesses the symmetry of the data series, demonstrates that all the variables under consideration were positively skewed. Positive skewness denotes that the right-handed tail is greater than its left-handed counterpart.

Kurtosis assesses the peakiness or flatness of a data series' distribution. The kurtosis of a normal distribution is exactly 3. The kurtosis value of 3 for health indicates that the data set has a normal distribution. According to Westfall (2014), a greater kurtosis demonstrates that a greater proportion of the variation is attributable to infrequent and extreme deviations compared to frequent and moderate departures. Leptokurtic describes a distribution with kurtosis of more than three (excess kurtosis greater than zero). Its tails are longer and flatter, and its central peak is frequently higher and more pointed. The results also indicate that investment had a kurtosis value greater than 3, indicating that the dataset did not follow a normal distribution. GDP, education, health, social protection, and defense all had kurtosis values below 3, indicating that the distribution was shorter, and the dataset had a lighter tail than a normal distribution. Westfall (2014) identifies a distribution with a kurtosis of 3 (excess kurtosis 0) as platykurtic. It is less steeply peaked than the standard distribution, has shorter and thinner tails, and its central peak is frequently lower and broader.

The Jarque-Bera test is a measure of goodness-of-fit that compares the skewness and kurtosis of a data series to those of a normal distribution. The probability of Jarque-Bera statistics for the variables GDP, defense, investment, and inflation was above the

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Table 2. Descriptive Statistics of Variables: 1983–2020

Variables	GDP	EDU	HLTH	SP	DEF	INV	INFL	Observation
Mean	2139135	90758	50859	60864	19623	19.29	8.73	35
Median	1954710	53451	25662	29959	12673	19.10	7.10	35
Maximum	3119984	306584	185291	222156	47173	27.90	18.70	35
Minimum	1447310	4348	2394	1511	3477	15.20	1.40	35
Standard Deviation	574726	90520	54936	65749	12825	3.00	4.34	35
Skewness	0.44	1.06	1.16	1.03	0.65	0.86	0.61	35
Kurtosis	1.65	2.86	3.01	2.81	2.19	3.54	2.32	35
Jarque-Bera	3.81	6.62	7.81	6.22	3.45	4.74	2.85	35
Probability	0.15	0.04	0.02	0.05	0.18	0.09	0.24	35

Analysis by author.

Table 3. Correlation Results

Correlation	LGDP	LEDU	LDEF	LINV	LHLTH	LINFL	LSP
lnGDP	1.00						
	----						
lnEDU	0.95	1.00					
	(17.58)***	-----					
lnDEF	0.95	0.98	1.00				
	(17.95)***	(28.19)***	-----				
lnINV	-0.06	-0.34	-0.27	1.00			
	(-0.37)	(-2.05)	(-1.63)	-----			
lnHLTH	0.97	1.00	0.98	-0.28	1.00		
	(22.03)***	(82.26)***	(28.86)***	(-1.67)	-----		
lnINFL	-0.65	-0.71	-0.65	0.45	-0.70	1.00	
	(-4.91)	(-5.81)	(-4.94)	(2.89)	(-5.58)	-----	
lnSP	0.95	1.00	0.97	-0.34	0.99	-0.73	1.00
	(17.64)***	(64.75)***	(24.60)***	(-2.05)	(51.01)***	(-6.21)	-----

T-statistics in parentheses ( ). *** 1%.
Analysis by author.

statistical significance level (0.05). Therefore, the null hypothesis could not be rejected, indicating that GDP, defense, investment, and inflation followed a normal distribution.

In addition, the probability of Jarque-Bera statistics for education, health, and social protection variables was more than or equal to the statistical significance level (0.05), thereby rejecting the null hypothesis of a normal distribution. The results indicated that the skewness and kurtosis of the education and health datasets lacked a normal distribution, indicating that the data series were not normally distributed.

4.2 Correlation Analysis

Correlation analysis determines the strength and direction of the linear relationship between two variables. The correlation coefficient ranges from -1 to 1, where a value of 1 denotes a perfect correlation between variables, and a value of 0 suggests no linear relationship between the variables (Enders, 2004). Table 3 presents the results.

The correlation matrix shows that all factors of importance are substantially associated with GDP. All government spending components show over 90% positive relationships with GDP. Thus, when government expenditure on consumption and investment increased, so did the GDP. These findings are consistent with those of Ebiringa et al. (2012), who investigated the relationship between government sectoral expenditure and economic growth in Nigeria. Their findings indicate a correlation between public spending on defense, education, health, and economic development. Butkiewicz et al. (2011) concluded that the positive association between public expenditure on health, education, and defense and economic growth in developing countries was insignificant. In addition, the correlation coefficients between GDP and the control variables (investment and inflation) were negative.

4.3 Unit Root Test Results

The ADF and PP tests are used to test the stationarity of the variables. The results of the ADF and PP unit root tests at levels and their first differences are summarised in table 4.

The results show that the variables of interest were non-stationary at their levels, as shown by the tests; however, the variables became stationary after first differencing. The series was integrated into order 1, I(1). The null hypothesis states that the variables under consideration have a unit root and is rejected at all significance levels.

4.4 ARDL Bounds Test for Cointegration

The ARDL limits test for cointegration technique, popularized by Pesaran (2001), is used to determine whether the variables have a long-run relationship, given thatthey are all integrated of order one (1). The lag duration is determined by selecting the optimum model using the Akaike Information Criterion (AIC). The AIC is a powerful tool used to determine the best-fitting model.

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Table 4. Unit Root Test Results

Variables	Model	Levels		1st Difference		
		T-Stat (ADF)	T-Stat (PP)	T-Stat (ADF)	T-Stat (PP)	Conclusion
ln**GDP**	Trend & Intercept	-2.888	-1.592	-3.755**	-3.761**	I(1)
ln**EDU**	Trend & Intercept	-1.986	-1.986	-4.325***	-4.325***	I(1)
ln**DEF**	Trend & Intercept	-2.421	-2.454	-5.109***	-5.148***	I(1)
ln**INV**	Trend & Intercept	-2.549	-2.444	-3.799**	-3.458*	I(1)
ln**HLTH**	Trend & Intercept	-2.066	-2.101	-4.810***	-4.784***	I(1)
ln**INFL**	Trend & Intercept	-3.183	-3.024	-5.661***	-11.849***	I(1)

ADF *** 1% = -4.3, ** 5% = -3.6
PP *** 1% = -4.3, ** 5% = -3.6, *10%=-3.21
Analysis by author.

Table 5: ARDL Bounds test for cointegration results

Specification	Model	F-Statistics	Critical Value Bounds			Cointegration Status
			Significant	Lower Bound	Upper Bound	
LGDP= *f* {LEDU, LDEF, LINV, LHLTH, LINFL, LSP}	**Critical Values for K= 6**					
	(3, 3, 3, 2, 2, 3, 2)	8.54***	1%	2.88	3.99	Cointegration
			2.5%	2.55	3.61	
			5%	2.27	3.28	
			10%	1.99	2.94	

Null hypothesis: No long-run relationships exist. *** 1%. K is the number of explanatory variables.
Analysis by author.

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It functions as a roughly impartial estimator when n (data period) is large, and k (independent variables) is relatively modest. AIC also addresses the concerns of overfitting and underfitting. The model aids in predicting future data by analyzing observed data and if future data will follow the same distribution. Therefore,AIC remains a feasible model selection method, and the maximum lag order of 3 was chosen for the conditional ARDL in this work based on AIC. Table 5 displays the outcomes.

The optimal length is selected based on the number of regressors in the model, which is ARDL (3, 3, 3, 2, 2, 3, 2) with an adjusted R^2 of 0.99. The results show the computed F-statistics of 8.54, which is significant at the 1% critical upper bound. Thus, the null hypothesis is rejected, and the study inferred that a long run cointegration among the underlying variables exists.

4.5 Error Correction Model (ECM)

An ECM helps to examine equilibrium or disequilibrium between long-run equilibrium and short-run dynamic adjustments. In Table 6, the results of the long-run coefficients and short-run dynamic adjustments are shown in panels A and B, respectively.

Except for government spending on education and defense, all variables have the predicted signals over the long run. The finding indicates that the coefficient of government investment in education harmed economic growth and was statistically significant at the 1% level (Panel A). This suggests that a one percent increase in schooling will result in a 0.40 percent decline in long-term economic growth. Despite the government spending on education, the South African economy was not improved in the long run. This could be attributed to the education system's failure, devastatingly impacting the local economy and unemployment rate. The country's flawed education system is also responsible for the disparity in low labor productivity, returns on the skill, and low income in the self-employed informal sector ((FFC), 1998). This negative conclusion is consistent with Kouton (2018)'s empirical analysis in Côte d'Ivoire using annual data from 1970 to 2015 using the ARDL approach, which indicated that government education expenditure negatively affects long-term growth. Despite a very slight positive correlation, the current analysis found no substantial effect of government consumption on defense on economic growth over the long term.

In addition, the data suggested that government investment expenditure on health had a favorable long-term impact on economic growth at all significance levels. Thus, a 1 percent rise in government health expenditures will result in a 0.40 percent boost in long-term economic growth. This implies that the economic well-being of each population contributes to increased labor force productivity and, thus, economic expansion. Budget-wise, the health sector is prioritized in South Africa; most expenditures are allocated to the health sector, and its growth is consistent. A robust policy framework manages this sector with well-defined objectives, and donor funds have continued to make substantial contributions.

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Table 6: Estimated Long- and Short-Run Coefficient Results

Panel A: Long-run Coefficients			
Variable	**Coefficient**	**Std. Error**	**t-Statistic**
LOG_EDU	-0.395***	0.119	-3.313
LOG_DEF	0.005	0.03	0.152
LOG_INV	0.331***	0.081	4.076
LOG_HLTH	0.397***	0.115	3.446
LOG_INFL	-0.111***	0.019	-5.774
LOG_SP	0.139***	0.034	4.062
C	12.600***	0.375	33.602
Panel B: Short-run Coefficients			
Variable	**Coefficient**	**Std. Error**	**t-Statistic**
Δ (LOG_GDP(-1))	-0.381**	0.129	-2.954
Δ (LOG_GDP(-2))	-0.260***	0.132	-1.971
Δ (LOG_EDU)	-0.015	0.031	-0.472
Δ (LOG_EDU(-1))	-0.001	0.035	-0.04
Δ (LOG_EDU(-2))	0.077**	0.028	2.771
Δ (LOG_DEF)	0.098***	0.014	7.149
Δ (LOG_DEF(-1))	0.110***	0.016	7.005
Δ (LOG_DEF(-2))	0.032**	0.014	2.323
Δ (LOG_INV)	0.322***	0.03	10.718
Δ (LOG_INV(-1))	-0.079**	0.026	-3.001
Δ (LOG_HLTH)	0.079**	0.033	2.376
Δ (LOG_HLTH(-1))	-0.089**	0.034	-2.656
Δ (LOG_INFL)	-0.020***	0.003	-7.55
Δ (LOG_INFL(-1))	0.028***	0.005	5.963
Δ (LOG_INFL(-2))	0.027***	0.003	8.566
Δ (LOG_SP)	0.044***	0.009	4.654
Δ (LOG_SP(-1))	-0.061***	0.009	-6.925
Ect(-1)	-0.727***	0.062	-11.688

***1%, **5%.

Analysis by author.

South Africa is one of the continent's leading investors in health (UNICEF, 2017). The study conducted by Oluwatoyin (2010) in Nigeria confirms the positive effect of government health expenditures on economic growth.

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In addition, it was discovered that government spending on social protection has a statistically significant positive effect on economic growth. This suggests that a one percent rise in government spending on social safety will result in a 0.14 percent increase in long-term economic growth. Consequently, government consumption expenditures on social protection exhibited the expected characteristics.

In addition, in terms of the control variables, the inflation rate exhibits the expected negative sign in the long run, exerting a negative effect on economic growth that is statistically significant. Hodge (2006) studied the relationship between inflation and growth in South Africa from 1950 to 2002 and identified a substantial negative relationship between the two variables over the medium to long term. Similarly, investment exhibited the anticipated long-term positive trend, indicating that a 1% increase in investment will result in a 0.3% increase in economic growth.

As anticipated, the results for short-run dynamic adjustment demonstrate a negative error correction coefficient smaller than one and statistically significant at all levels. The ECM value was negative and less than 1, indicating that the variables were approaching equilibrium. The considerable error correction term (ECT) confirms that a 73 percent yearly rate of adjustment to equilibrium will be rectified, which is favorable. Consequently, based on the findings mentioned above, we may conclude that in South Africa, data corroborate the Keynesian law, which states that government expenditure generally stimulates economic growth. The research passed the diagnostic battery.

Stability tests are used to determine whether a model is stable and, therefore, dependable and whether it exhibits structural changes. Figures 1 and 2 depict the stability test results for the cumulative sum of recursive residuals (CUSUM) and the sum of squares of recursive residuals (CUSUMSQ), respectively. The results of the stability tests indicate that the model is stable, as characterized by the presence of blue lines between two red dashed (critical) lines. The straight line represents crucial limits at a 5% significance level. The CUSUM and CUSUMSQ test results fall inside the 5% margin, confirming the model's excellent performance while the variances are constant.

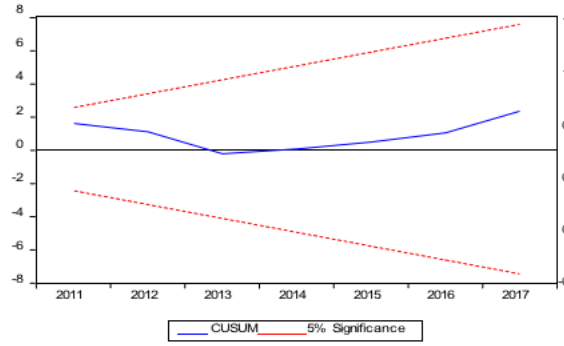

Figure 1. CUSUM Test

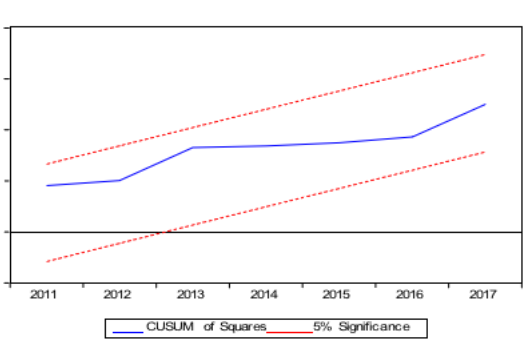

Figure 2. CUSUMSQ Test

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5. CONCLUSION AND POLICY RECOMMENDATIONS

This study contributes to the ongoing general discussion regarding the effect of government spending on economic growth by empirically examining the impact of total government consumption and investment spending and the effect of further disaggregated components of government investment spending on the one hand and government consumption spending on the other. The study evaluates the impact on South African economic growth of government investment expenditure on education and health separately, government consumption spending on defense and social protection, and other control variables.

This study departs from prior research that calculated the impacts of aggregated or disaggregated government spending on total investment, consumption, and economic growth. Due to the unavailability of quarterly data on the variables of interest, the study analyzes annual time series data for 1983–2020 and employs the ARDL, and ECM approaches.

The findings of the ARDL limits test for cointegration analysis supported the existence of a long-term link between the variables. Results demonstrated that the GDP would increase over time when the government raises health, defense, and social protection spending. In the meantime, government investment in education benefits economic growth in the short run but has a negative effect in the long run. Long-term, the analysis found no correlation between government spending on defense and economic development. However, the correlation was statistically and economically significant in the short term.

Following Keynesian theory and Barro (1990) addressing the role of government spending as an exogenous factor of economic growth, these findings indicate that government spending has an impact on national income. Moreover, the results are comparable to those of similar international studies (Dash et al., 2008; Easterly et al., 1993; Fajingbesi et al., 1999). Thus, economic growth in South Africa depends on government spending as a significant element.

The results will enable the domains of government to establish and modify economic development strategies that will deliver the required economic growth following the South African blueprint for radical economic transformation. Given the long-term negative association between government investment expenditure on education and economic development, it may be concluded that despite the considerable portion of government spending committed to education, it did not contribute to the country's economic growth. To increase output, it is advised that the government prioritize the efficient use of resources by spending more on development-effective educational strategies and the maintenance and improvement of education quality.

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There is reliable evidence that the quality of education substantially impacts individual wages and economic growth (Hanushek et al., 2007). Therefore, policies should prioritize quality education and teacher quality improvement, as both are crucial to student performance. It is crucial, therefore, to create an educational program for experimentation and evaluation. Also, education policy must be progressive, with ongoing review allowing the government to eliminate ineffective programs while preserving and adopting more productive ones.

Regarding health spending, the government needs to continue investing in health activities. Still, it might allocate more resources to enhancing the quality of health services offered to the public and enhancing the efficiency of health system administration. In addition, the government should expedite and implement its National Health Insurance work program (NHI).

In addition, the government invests heavily in social protection to combat poverty, low economic growth, and development and reduce vulnerability. Based on the favorable long-term effect of government consumption expenditure on social protection on the growth performance of the nation, more resources should be allocated to social protection initiatives that maximize productivity. The report proposes giving money to social protection to facilitate other economic reforms, which can contribute favorably to economic growth and development. Mitchell (2005) confirmed that defense expenditures do not add to national production. Therefore, government spending on initiatives or programs that provide less benefit to residents or incur greater costs should be minimized. Comparative investigation of the effects of government spending on sectoral economic growth could serve as a starting point for more research.

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