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Talknice Saungweme

Nicholas M. Odhiambo

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Talknice Saungweme
Department of Economics
University of South Africa
P. O. Box 392, UNISA
0003, Pretoria
South Africa
Emails: talknice2009@gmail.com

Nicholas M. Odhiambo
Department of Economics
University of South Africa
P. O. Box 392, UNISA
0003, Pretoria
South Africa
Emails: odhianm@unisa.ac.za / nmbaya99@yahoo.com

RELATIVE IMPACT OF DOMESTIC AND FOREIGN PUBLIC DEBT ON ECONOMIC GROWTH IN SOUTH AFRICA

Talknice Saungweme[1] and Nicholas M. Odhiambo[2]

Abstract

This paper investigates the debt-growth nexus by testing both the impact of aggregate public debt on economic growth, and the relative impact of domestic and foreign public debt on economic growth using South Africa as the case study – from 1970 to 2017. Based on the autoregressive distributed lag (ARDL) technique, the findings reveal that the impact of aggregated public debt on economic growth in South Africa is statistically significant and negative, both in the short run and in the long run. The results further reveal that domestic public debt and economic growth have a statistically significant and positive relationship in the short run only. Furthermore, foreign public debt has a statistically significant and negative relationship with economic growth but only in the long run. Therefore, the study recommends the government to manage effectively its debt and to finance long-term high returning productive investments that should translate into economic growth. Finally, the study cautions the country against growing public debt, predominantly foreign debt, to finance its increasing recurrent expenditure needs.

Keywords: Public debt, domestic public debt, foreign public debt, economic growth, South Africa

JEL Classification: H63, O47

[1] Corresponding author; Department of Economics, University of South Africa, P.O. Box 392, UNISA 0003, Pretoria, South Africa. Email: talknice2009@gmail.com

[2]Professor; Department of Economics, University of South Africa, P.O. Box 392, UNISA 0003 Pretoria, South Africa. Email: odhianm@unisa.ac.za

1. Introduction

In the literature, public debt can be growth-enhancing when it is confined to productive activities that help in diversifying the economy and in expanding the export structures (Spilioti and Vamvoukas, 2015; Kobayashi, 2015; Balcilar, 2012; DeLong and Summers, 2012). On the contrary, public debt can be growth-inhibiting when it discourages physical capital formation and impels capital flight, particularly due to public policy uncertainty (Levy and Chowdhury, 1993; Modigliani, 1961). The crowding-out effect of public debt on private sector investment is worse in the presence of a narrow national revenue base (Boccia, 2013; Alesina and Tabellini, 1989). The crowding-out effect exists when public sector borrowing, originating mostly from budgetary imbalances, reduces the lending capacity of the economy (Huang *et al.,* 2018). The excessive borrowing by the government on domestic capital markets elicits credit rationing and high cost of borrowing (Cecchetti *et al.,* 2011).

In this study, the dynamic impact of public debt – domestic and foreign – and economic growth in the only dominant economy south of the Sahara, South Africa, is investigated. As the only upper-middle-income economy in sub-Saharan Africa, South Africa is the regional manufacturing and financial hub (World Bank, 2018; Odhiambo, 2011). The country relied extensively on its domestic debt market for debt financing, beginning in the mid-1980s when the country was under anti-apartheid economic and financial sanctions (Carmody, 2002).

Although existing empirical literature generally supports the crowding-out effect of public debt on economic growth (see, Huang *et al.,* 2018; Gómez-Puig and Sosvilla-Rivero; 2018; Baldacci and Kumar, 2010; among others), it is still open to debate over which type of public debt – domestic or foreign – is more important or more disastrous to economic growth (see, for example, Akram, 2016; 2015; Hausmann and Panizza, 2011; De Grauwe, 2011; Yakita, 2008; Adams and Bevan, 2005). Thus, for policymakers who are anxious about improving economic growth rates, it is not just the size of aggregate public debt relative to broad macroeconomic performance indicators, such as gross domestic product (GDP) and exports, that matters, but its composition between domestic and foreign debt and the currency denomination of this debt.

The choice between domestic and foreign public debt is not clear-cut and is reflected distinctly by fluctuations in market variables (such as interest rates) and debt repayment options (see Hawkins and Turner, 2000). For instance, the major macroeconomic difference between domestic and foreign public borrowing in the short-term is that government borrowing

internally raises domestic interest rates, which ultimately crowds-out private sector borrowing, or perhaps compels the private sector to borrow abroad (International Monetary Fund "IMF", 2002). However, according to Furman and Stiglitz (1998), foreign public borrowing in the short-term imposes no such crowding-out effect, although in the long-term, rising debt repayments negatively affect the economy.

Further, in the case of foreign public debt, governments have limited provision of foreign currency liquidity, thus constraining their fiscal space to fund developmental projects and welfare programmes. However, governments can provide virtually unlimited domestic currency liquidity in the case of debt denominated in domestic currency (mostly through seignorage and control of domestic interest rates) (Hawkins and Turner, 2000).

Additionally, public debt servicing, particularly in developing and emerging economies (whose local interest rates surpass international rates), incentivises governments to rely too much on foreign currency debt, simply because it minimises current interest costs (United Nations Conference on Trade and Development "UNCTAD", 2017). However, this option is very imprudent because it makes the country susceptible to contagion risks as the debt securities may become problematic to roll over in the event of global crisis or imposition of economic and financial sanctions on a country (UNCTAD, 2017). More so, servicing foreign public debt, ceteris paribus, lowers economic growth because the monetary payments flow out of the country. These debt payments reduce financial resources available to invest in expanding tradable sectors and in improving public services, which can help in economic development.

The burden of foreign public debt on developing countries, especially African countries, often arises because of their traditionally high dependency on commodity exports (World Bank, 2018). The commodity price downturn, exchange rate volatility and sluggish global aggregate demand that started in 2011 (which leads to a decline in the terms of trade and sharp deterioration in current account balances) are among the major contributing factors heightening government debt crises and subdued economic performances across the developing world (World Bank, 2018; UNCTAD, 2017).

Furthermore, most African countries and other economies in the developing world are subjected to frequent foreign public debt crises because of low credit ratings and high sovereign spreads (UNCTAD, 2009). Low credit ratings bring about high borrowing costs to developing countries and emerging market economies (UNCTAD, 2009). These in turn, for the most part, fuel short-term speculative rather than long-term productive investments, which are a constant

source of macroeconomic instability (UNCTAD, 2009). Moreover, growing levels of foreign public debt can discourage foreign and private sector investment because of concerns linked to future tax uncertainties (Panizza, 2016). "As a consequence, the new orthodoxy is that external capital is, at best, not necessary, and, at worst, detrimental to economic growth" (Panizza, 2016: 1).

In view of the foregoing, this study investigates the topic of domestic versus foreign public debt with the case of South Africa, because the component of domestic public debt in the country has been higher than its foreign counterpart since the 1980s (Republic of South Africa "RSA", 1998). The massive institutional and legal public debt management reforms that were implemented by the South African government beginning 1994 further increased the proportion of domestic public debt relative to foreign public debt (see Saungweme and Odhiambo, 2018). Against this background, this paper attempts to empirically examine the macroeconomic impact of aggregate public debt on economic growth, while simultaneously estimating the relative impact of domestic and foreign public debt on economic growth in South Africa from 1970 to 2017 – using the Autoregressive Distributed Lag (ARDL) bounds testing approach.

The contribution of the paper to the literature on the debt-growth debate in South Africa is twofold. Firstly, unlike most of the past studies conducted on the subject that focussed only on aggregated public debt, this paper disentangles public debt into domestic and foreign components, and jointly examines the impact of both the aggregated and disaggregated public debt on economic growth in South Africa. The few available studies for South Africa, such as those by Mhlaba and Phiri (2019) and Ncanywa and Masoga (2018), have only investigated the impact of aggregate public debt on economic growth. Therefore, investigating the relative impact of domestic and foreign public debt on economic growth could provide additional insights into the ongoing debate on public policy frameworks desired to develop the country's financial sector and ensure both debt sustainability and macroeconomic stability.

Secondly, unlike most previous studies that bundle countries together, especially in cross-sectional analysis, the paper applies the time-series approach using comparatively more recent data set (1970-2017) in a single country analysis. This approach caters for country-specific effects often ignored by other studies (Gómez-Puig and Sosvilla-Rivero, 2018; Akram, 2016; Egert, 2015; Reinhart and Rogoff, 2010).

The remaining part of the paper is organised as follows: Section 2 highlights the past trends in public debt in South Africa from 1970 to 2017. A review of the theoretical and empirical literature follows in Section 3, while the estimation techniques and empirical analysis are presented in Section 4. Lastly, conclusions and policy implications that emerged from the study are given in Section 5.

2. A highlight of the past reforms and trends in public debt and economic growth in South Africa

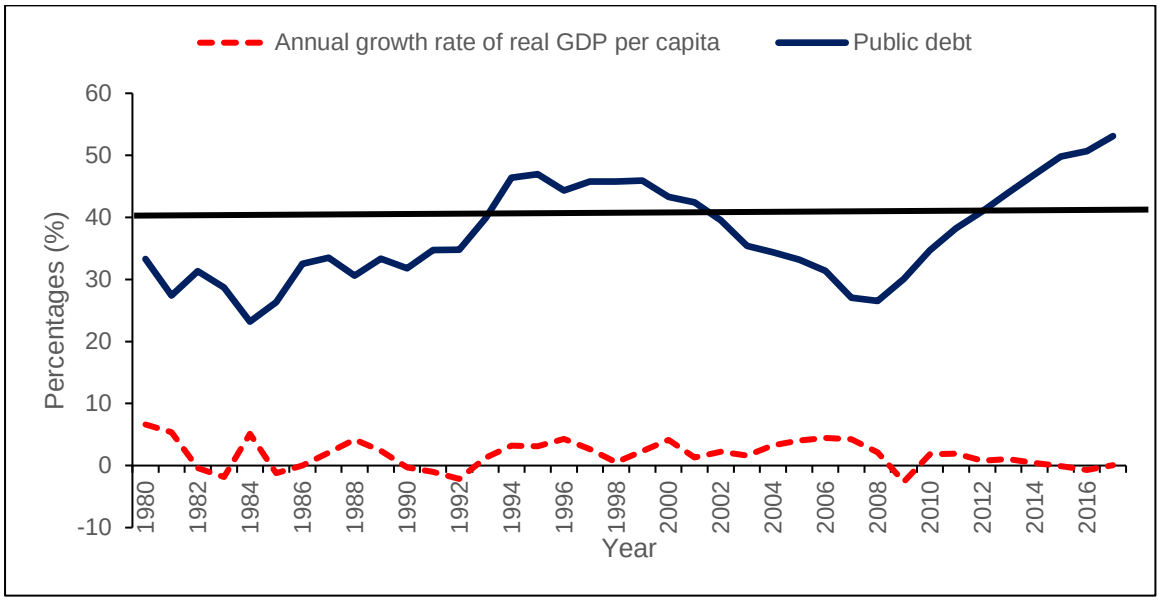
South Africa is a newly industrialised country which has undergone a series of economic, political and financial transformations since the 1970s. These restructurings were accompanied by massive institutional and legal public debt management reforms which caused substantial changes in public debt structure and composition (Nattrass and Ardington, 1990; South African Reserve Bank "SARB", 2018). The institutional reforms included the formation of numerous public finance management institutions, such as the National Treasury, the Bond Exchange of South Africa, and the Fiscal Finance Commission, among others (Majam, 2017; RSA, 2014). These public sector financial reforms strengthened the development of both primary and secondary debt markets in South Africa. Currently, South Africa's government debt is mostly denominated in local currency, Rands, with a small proportion of the country's domestic debt being held by non-residents (RSA, 2015). [3]

Among the economic growth strategies that were implemented by the South African government since the 1990s are the Reconstruction and Development Programme (RDP) of 1994, the Growth, Employment and Redistribution (GEAR) policy of 1996, the Accelerated and Shared Growth Initiative for South Africa (ASGISA) of 2005, the New Growth Path Framework of 2010 and the National Development Plan 2030 of 2011 (National Planning Commission, 2011; RSA, 2010; The Presidency, 2006). These economic policies led to the growth in private sector participation in national development and are largely attributed to the positive economic growth rates recorded in South Africa between 1994 and 2014, except in 2009 (World Bank, 2018). Figure 1 presents a summary of public debt and economic growth trends in response to the various financial and economic policies implemented in South Africa

[3] *For comprehensive review of public debt trends, reforms and challenges in South Africa, see Saungweme and Odhiambo (2018).*

between 1980 and 2017. Public debt is expressed as a percentage of real gross domestic product (RGDP), while economic growth is measured by the annual growth rate of real GDP per capita.

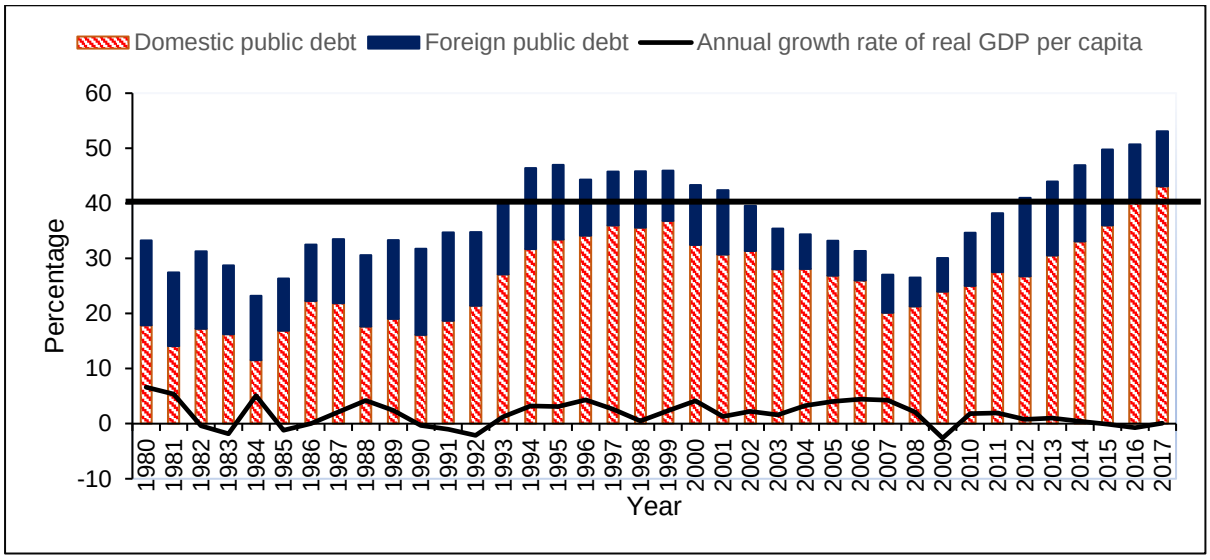
Figure 1: Trends in public debt and economic growth in South Africa (1980 - 2017)



Source: Authors' computations based on World Bank (2018) databank

Figure 1 shows three distinct phases in the evolution of public debt in South Africa; that is, 1980 – 1994, 1995 – 2008 and 2009 – 2017. Generally, between 1984 and 1994 public debt/RGDP per capita ratio maintained an upward trajectory, springing mainly from rising fiscal deficits, which reached a period peak of 47% in 1994 (Statistics South Africa, 2017). This was followed by a marked decrease in the public debt/RGDP per capita ratio during the period from 1995 to 2008. As Figure 1 illustrates, between 1993 and 2001, South Africa was in public debt distress, a condition which prompted the country to continue reforming financially and economically. These reforms facilitated the reduction in budget deficits and promoted remarkable economic growth rates, resulting in the downward trend of the public debt to real GDP ratio displayed in Figure 1; reaching a period low of 25.9% in 2008 (RSA, 2012). Also, during this phase, 1995 – 2008, there was massive industrialisation drive, which helped in the economic diversification of this economy (African Development Bank *et al.*, 2017). In the last phase, 2009 – 2017, there is a noticeable upward trend in the public debt/RGDP per capita ratio, which can be attributed to the tail-effects of the 2008 global financial crisis and also to the introduction of new government debt instruments (Statistics South Africa, 2017; RSA, 2011). Figure 2 gives a pictorial view of the composition of public debt between 1980 to 2017, expressed as a ratio of real GDP.

Figure 2: Public debt structure in South Africa (1980-2017)



Source: Authors' computations based on SARB (2018) data

As portrayed in Figure 2, the government of South Africa has been predominantly relying on the domestic capital markets to finance its budget needs, as domestic public debt constitutes a major part of the total public debt, while the share of foreign public debt in the total public debt has, overall, declined over time. In the period between 1995 and 2001, the decrease in public debt/RGDP per capita ratio was mostly emanating from the government's drive to reduce the foreign debt component and also from the overall growth of the economy, as shown in Figure 2 (World Bank, 2018). The blending of a wide basket of government securities and attractive interest rates has added to the broadening of the country's investor base (RSA, 2016a; 2016b; 2016c). Figure 2 also shows that South Africa breached the IMF and World Bank public debt indicative threshold of 40% between 1993 and 2002, and between 2012 and 2017 – being caused by an exponential growth in domestic public debt that reached 43.1% in 2017 (SARB, 2018).

3. Public debt and economic growth: A review of literature

Until now, the theoretical and empirical literature on the impact of public debt on economic growth has been vast, and in some instances, the results have been conflicting. There are four strands of theoretical literature that explain the relationship between the different types of sovereign debt and economic growth.

The first component argues that public debt – domestic and foreign – and economic growth are negatively correlated. This view is supported mainly by the public debt overhang hypothesis (Myers, 1971), and the crowding-out effect (Krugman, 1988; Diamond, 1965; Modigliani, 1961). The second strand of literature argues that public debt and economic growth are positively related. This proposition is supported in the literature by the dual gap theory (Krueger, 1987; Chenery and Strout, 1966), the Wagner's hypothesis of "Law of increasing state activity" (Wagner, 1893) and the Keynesians' fiscal multiplier effect (Rebelo, 1995; Arrow and Kuz, 1970).

The third strand of literature disregards any relationship between public debt and economic growth, known in the literature as the Ricardian Equivalence Hypothesis (Barro, 1974). Finally, is another set of theoretical literature purporting that the relationship between public debt and economic growth is nonlinear. According to this hypothesis, at low levels public debt is growth-enhancing, but beyond a certain point, public debt leads to lower and possibly negative economic growth rates (Sachs, 1989).

Empirically, four groups of studies have been identified. Firstly, are those studies that predominantly focussed on the relationship between aggregate public debt and economic growth (Huang *et al.,* 2018; Gómez-Puig and Sosvilla-Rivero, 2018; Ncanywa and Masoga, 2018; Chudik *et al.,* 2017; 2016; Nantwi and Erickson, 2016; Bonga *et al.,* 2015; Kobayashi, 2015; Dogan and Bilgili, 2014; Afonso and Jalles, 2013). The findings from these studies varied across studied economies. While some studies found a negative relationship between public debt and economic growth (Huang *et al.,* 2018; Gómez-Puig and Sosvilla-Rivero, 2018; Ewaida, 2017; among others), others found a positive relationship (Balcilar, 2012; Greiner, 2011; Abu-Bakar and Hassan, 2008). Yet other studies found either a nonlinear relationship (Dogan and Bilgili, 2014; Baum *et al.,* 2012; Minea and Parent, 2012, among others) or no relationship between the variables (Kourtellos *et al.,* 2013). The empirical results on the impact between aggregated public debt and economic growth are, therefore, far from conclusive and vary across model specification, sample estimation method and public debt proxy used.

Secondly, are those studies that only tested the impact of foreign public debt on economic growth (Soydan and Bedir, 2015; Ahmed, 2012; Ndikumana and Boyce, 2012; Pattillo *et al.,* 2011; 2004; Clements *et al*., 2003; Chowdhury, 2001). The bulk of these empirical studies provide evidence that supports the view that high levels of foreign public debt

retard economic growth (Salotti and Tcecroci, 2012; Clements *et al.*, 2003). However, the results of Romero and Burkey (2011) reveal that low levels of foreign public debt are growth-enhancing.

Thirdly, is yet another strand of empirical studies that analyses the impact of domestic public debt on economic growth and the results are mixed (see, for instance, Bua *et al.*, 2014; Mehrotra *et al.*, 2012; Presbitero, 2012; Arnone and Presbitero, 2010; among others). According to Gulde *et al.* (2006) and Moss *et al.* (2006), domestic public borrowing stimulates economic growth by deepening money and financial markets, and thus assist in mobilising investment funds.

Lastly, is the strand of empirical literature that explores the relative impact of domestic and foreign public debt on economic growth (Mohanty and Panda, 2019; Akram, 2016; 2015; Yakita, 2008, and Adams and Bevan, 2005). For instance, the results of Akram (2015) reveal that in the Philippines, foreign public debt is statistically significant and negatively related to economic growth, while domestic public debt and economic growth have a statistically significant and positive relationship. In addition, using a sample of four countries – Bangladesh, India, Pakistan and Sri Lanka – the results of Akram (2016) show that although aggregate public debt has a statistically significant and negative impact on economic growth, foreign public debt insignificantly affects economic growth, while domestic public debt has a statistically significant and positive impact on economic growth. Contrary, the results of Mohanty and Panda (2019) show that domestic public debt has a more adverse impact on the Indian economy than foreign public debt.

Overall, the review of empirical literature on the relationship between public debt and economic growth has shown that the impact of public debt (domestic and foreign) on economic growth across studied countries has been mixed and inconclusive. On the whole, this study has revealed that: (i) most previous studies focussed on the relationship between aggregated public debt and economic growth; (ii) there is overwhelming evidence supporting a negative impact of aggregated and disaggregated public debt on economic growth; (iii) more studies were conducted on the impact of foreign public debt than on the impact of domestic public debt on economic growth; and (iv) the literature on the relative impact of domestic and foreign public debt on economic growth is scanty and still at nascent stage.

4. Methodology, data description and sources, and empirical analysis

4.1. Cointegration – Autoregressive Distributed Lag ARDL bounds testing procedure

This study utilises the ARDL bounds testing procedure to test the impact of aggregated and disaggregated public debt on economic growth in South Africa (Pesaran and Shin, 1999; Pesaran *et al.*, 2001). The chosen approach has several superior properties over the residual-based approach by Engle and Granger (1987), and the full maximum likelihood approach by Johansen and Juselius (1990). For instance, the ARDL approach captures the short- and long-run relationships simultaneously, and the t-statistics from the ARDL procedure are valid, and its long-run estimates are unbiased (Pesaran and Shin, 1999; Odhiambo, 2011). Also, the ARDL approach can be used when the variables are integrated of order zero [I(0)] or order one [I(1)].

4.2 Data sources and description

The study uses annual time-series data, spanning the period from 1970 to 2017 and are obtained from various sources, namely, the World Bank Development Indicators of the World Bank and South African Reserve Bank (SARB, 2018; World Bank, 2018). Table 1 gives a description of all the regression variables used in the study.

Table 1: Variable description

Notation	Variable description
y	Annual growth rate of real GDP per capita (a proxy for economic growth)
PD	Public debt/RGDP ratio (a proxy for public debt)
DPD	Domestic public debt/RGDP ratio (a proxy for domestic public debt)
FPD	Foreign public debt/RGDP ratio (a proxy for foreign public debt)
INV	Gross fixed capital formation/RGDP ratio (a proxy for gross domestic investment)
LBR	Economically active population aged between 15 and 64 years/Total working age population ratio (a proxy for labour)
FB	Fiscal balance/RGDP ratio (a proxy of fiscal balance)
TOP	Sum of imports and exports as ratio of GDP (a proxy for trade openness)
SAV	Gross domestic savings/RGDP ratio (a proxy for savings)
TOT	Trade balance/RGDP ratio (a proxy for terms of trade)

4.2 The Impact of aggregated and disaggregated public debt on economic growth

To test the impact of public debt on economic growth, the study applies two models, Model 1 and Model 2. In Model 1, the study examines the impact of aggregate public debt on economic growth, while in Model 2, the relative impact of domestic and foreign public debt on economic growth was examined. Six control variables, that is, investment, labour, fiscal balance, trade openness, savings and terms of trade were added to each of the two models. The ARDL expression of Model 1 is given as:

ARDL specification for Model 1: Impact of public debt on economic growth

$$\Delta y_t = \phi_0 + \sum_{i=1}^{n} \phi_{1i} \Delta y_{t-i} + \sum_{i=0}^{n} \phi_{2i} \Delta PD_{t-i} + \sum_{i=0}^{n} \phi_{3i} \Delta INV_{t-i} + \sum_{i=0}^{n} \phi_{4i} \Delta LBR_{t-i}$$
$$+ \sum_{i=0}^{n} \phi_{5i} \Delta FB_{t-i} + \sum_{i=0}^{n} \phi_{6i} \Delta TOP_{t-i} + \sum_{i=0}^{n} \phi_{7i} \Delta SAV_{t-i} + \sum_{i=0}^{n} \phi_{8i} \Delta TOT_{t-i}$$
$$+ \sigma_1 y_{t-1} + \sigma_2 PD_{t-1} + \sigma_3 INV_{t-1} + \sigma_4 LBR_{t-1} + \sigma_5 FB_{t-1} + \sigma_6 TOP_{t-1}$$
$$+ \sigma_7 SAV_{t-1} + \sigma_8 TOT_{t-1} + \mu_{1t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (1)$$

Where y is the annual growth rate of real GDP per capita; PD is public debt; INV is investment; LBR is labour; FB is fiscal balance; TOP is trade openness; SAV is savings; TOT is terms of trade; ϕ_0 is a constant; $\phi_1 - \phi_8$ and $\sigma_1 - \sigma_8$ are the short-run and long-run regression coefficients, respectively; Δ is the difference operator; n is the maximum lag length; μ_{1t} is the error term; and t is the time period.

The error correction model based on Model 1 is expressed as follows:

$$\Delta y_t = \phi_0 + \sum_{i=1}^{n} \phi_{1i} \Delta y_{t-i} + \sum_{i=0}^{n} \phi_{2i} \Delta PD_{t-i} + \sum_{i=0}^{n} \phi_{3i} \Delta INV_{t-i} + \sum_{i=0}^{n} \phi_{4i} \Delta LBR_{t-i}$$
$$+ \sum_{i=0}^{n} \phi_{5i} \Delta FB_{t-i} + \sum_{i=0}^{n} \phi_{6i} \Delta TOP_{t-i} + \sum_{i=0}^{n} \phi_{7i} \Delta SAV_{t-i} + \sum_{i=0}^{n} \phi_{8i} \Delta TOT_{t-i}$$
$$+ \psi_1 ECM_{t-1} + \mu_{2t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (2)$$

Where y is the annual growth rate of real GDP per capita; PD is public debt; INV is investment; LBR is labour; FB is fiscal balance; TOP is trade openness; SAV is savings; TOT is terms of trade; ψ_1 is the coefficient of the ECM_{t-1}; ECM_{t-1} is the error-correction term lagged by one period; and t is the time period.

ARDL specification for Model 2: Relative impact of domestic and foreign public debt on economic growth

To examine the relative impact of domestic and foreign public debt in South Africa, the study applies the modified version of Akram (2016; 2015)'s models, and the ARDL expression of the model (Model 2) is given as:

$$\Delta y_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta y_{t-i} + \sum_{i=0}^{n} \beta_{2i} \Delta DPD_{t-i} + \sum_{i=0}^{n} \beta_{3i} \Delta FPD_{t-i} + \sum_{i=0}^{n} \beta_{4i} \Delta INV_{t-i}$$

$$+ \sum_{i=0}^{n} \beta_{5i} \Delta LBR_{t-i} + \sum_{i=0}^{n} \beta_{6i} \Delta FB_{t-i} + \sum_{i=0}^{n} \beta_{7i} \Delta TOP_{t-i} + \sum_{i=0}^{n} \beta_{8i} \Delta SAV_{t-i}$$

$$+ \sum_{i=0}^{n} \beta_{9i} \Delta TOT_{t-i} + \rho_1 y_{t-1} + \rho_2 DPD_{t-1} + \rho_3 FPD_{t-1} + \rho_4 INV_{t-1}$$

$$+\rho_5 LBR_{t-1} + \rho_6 FB_{t-1} + \rho_7 TOP_{t-1} + \rho_8 SAV_{t-1} + \rho_9 TOT_{t-1} + \mu_{3t}$$

$$\dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (3)$$

Where y is the annual growth rate of real GDP per capita; DPD is domestic public debt; FPD is foreign public debt; INV is investment; LBR is labour; FB is fiscal balance; TOP is trade openness; SAV is savings; TOT is terms of trade; β_0 is a constant; $\beta_1 - \beta_9$ and $\rho_1 - \rho_9$ are the short-run and long-run regression coefficients, respectively; Δ is the difference operator; n is the maximum lag length; μ_{3t} is the error term; and t is the time period.

The ECM for Model 2: Relative impact of domestic and foreign public debt on economic growth

$$\Delta y_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta y_{t-i} + \sum_{i=0}^{n} \beta_{2i}\, \Delta DPD_{t-i} + \sum_{i=0}^{n} \beta_{3i}\, \Delta FPD_{t-i} + \sum_{i=0}^{n} \beta_{4i}\, \Delta INV_{t-i}$$
$$+ \sum_{i=0}^{n} \beta_{5i} \Delta LBR_{t-i} + \sum_{i=0}^{n} \beta_{6i} \Delta FB_{t-i} + \sum_{i=0}^{n} \beta_{7i} \Delta TOP_{t-i} + \sum_{i=0}^{n} \beta_{8i} \Delta SAV_{t-i}$$
$$+ \sum_{i=0}^{n} \lambda_{9i} \Delta TOT_{t-i} + \psi_2 ECM_{t-1} + \mu_{4t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Where y is the annual growth rate of real GDP per capita; DPD is domestic public debt; FPD is foreign public debt; INV is investment; LBR is labour; FB is fiscal balance; TOP is trade openness; SAV is savings; TOT is terms of trade; ψ_2 is the coefficient of the ECM_{t-1}; ECM_{t-1} is the error-correction term lagged by one period; t is the time period.

In the event of a macroeconomic disturbance in the South African economy, the error correction terms in Equations (2) and (4) measure the short-run speed of adjustment towards the steady-state path of the estimated ARDL model (Chirwa and Odhiambo, 2017). Hence, the coefficient of the error correction term, in both equations, is expected to be negative and statistically significant, lying between 0 and 1.

4.3 Empirical findings and result discussion

Unit root test

The study begins by subjecting all regression variables to stationarity tests in order to ascertain whether the ARDL model is applicable or not. For this purpose, the study employs the Dickey-Fuller Generalised Least Square (DF-GLS) and the Perron, 1997 (PPURoot) unit root testing techniques. Tables 2 and 3 present the results of the stationarity tests.

Table 2: Stationarity test of all variables [Models 1 and 2]: DF-GLS test

Variable	Stationarity of all variables in levels		Stationarity of all variables in first difference	
	Without trend	With trend	Without trend	With trend
y	-4.928***	-4.946***	-	-
PD	-1.692*	-1.921	-	-5.444***
DPD	-1.008	-2.273	-2.680***	-6.793***
FPD	-1.779	-2.626	-4.203***	-4.573***
INV	-0.815	-1.702	-5.370***	-4.793***
LBR	-1.447	-3.294**	-4.977***	-
FB	-2.648***	-2.794	-	-6.537***
TOP	-1.964**	-2.315	-	-7.251***
SAV	-1.279	-1.765	-4.932***	-5.566***
TOT	-1.665*	-2.618	-	-6.643***

*Note: ***, ** and * denote stationarity at 1%, 5% and 10% significance levels, respectively.*

Table 3: Stationarity test of all variables [Models 1 and 2]: PPURoot test

Variable	Stationarity of all variables in levels		Stationarity of all variables in first difference	
	Without trend	With trend	Without trend	With trend
y	-5.578**	-5.588**	-	-
PD	-2.319	-2.781	-6.072***	-6.006***
DPD	-3.478	-2.879	-5.470**	-6.157**
FPD	-4.646	-4.488	-5.879**	-5.798**
INV	-3.425	-3.419	-6.346***	-6.423***
LBR	-4.057	-4.306	-6.910***	-8.300***
FB	-3.340	-3.274	-7.596***	-7.253***
TOP	-3.584	-3.754	-7.766***	-7.780***
SAV	-3.310	-3.491	-7.049***	-7.508***
TOT	-4.208	-4.197	-7.286***	-7.941***

*Note: *** and ** denote stationarity at 1% and 5% significance levels, respectively.*

The stationarity results reported in Tables 2 and 3 indicate that all the variables are integrated of order either zero or one, thus validating the applicability of the ARDL approach in the two models.

Bound F-statistic to cointegration

The study proceeds to test for the existence of the long-run relationship of the variables in the two models, Model 1 and Model 2. Table 4 presents the results of the bounds F-test for cointegration.

Table 4: ARDL-bounds test for cointegration – Models 1 and 2

Model	Dependent variable	Function	F-statistic	Cointegration status
1	y	F(y| PD, INV, LBR, FB, TOP, SAV, TOT)	3.641**	Cointegrated
2	y	F(y| DPD, FPD, INV, LBR, FB, TOP, SAV, TOT)	3.177*	Cointegrated

Asymptotic critical values (Unrestricted intercept and no trend)

Pesaran *et al.* (2001: 300) critical values	**1%**		**5%**		**10%**	
	I(0)	*I(1)*	*I(0)*	*I(1)*	*I(0)*	*I(1)*
[Table CI(iii) Case III]: Model 1	2.96	4.26	2.32	3.50	2.03	3.13
[Table CI(iii) Case III]: Model 2	2.79	4.10	2.22	3.39	1.95	3.06

*Note: ** and * denote statistical significance at 5% and 10%, respectively.*

The results in Table 4 show that the variables in the aggregated and disaggregated debt-growth models are cointegrated. This implies that the null hypothesis of no long-run relationship in the two models is rejected. Hence, the next step is to estimate the long-run coefficients and the associated error correction models.

Empirical result discussion

Based on the robustness of the results, the study selected AIC-based ARDL (3, 3, 1, 3, 3, 1, 3, 3) for Model 1 and AIC-based ARDL (3, 3, 1, 1, 3, 3, 3, 1, 1) for Model 2. Table 5 displays the estimated long-run coefficients of the two models, while Table 6 gives the estimated short-run coefficients of both models – Models 1 and 2.

Table 5: Long-run coefficients (Regressand: y)

Regressors	Model 1 Coefficient[*T-ratio*]	Model 2 Coefficient[*T-ratio*]
C	86.627** [*2.724*]	62.052** [*2.305*]
PD	-0.301* [*-1.809*]	-
DPD	-	-0.073 [*-1.312*]
FPD	-	-0.094** [*-2.573*]
INV	0.194* [*1.791*]	0.187* [*1.835*]
LBR	-0.294** [*-2.448*]	0.092* [*1.915*]
FB	-0.072** [*-2.613*]	-0.435** [*-2.514*]
TOP	0.160* [*2.064*]	-0.113** [*-2.232*]
SAV	0.177* [*1.988*]	0.290** [*2.384*]
TOT	-0.283 [*-1.593*]	-0.060 [*-0.629*]

*Note: ***, ** and * signify statistical significance at 1%, 5% and 10% levels, respectively.*

Table 6: Short-run coefficients (Regressand: Δy)

Regressors	Model 1 Coefficient[T-ratio]	Model 2 Coefficient[T-ratio]
Δy(1)	0.243* [*1.912*]	0.545** [*2.302*]
Δy(2)	0.264 [*1.377*]	0.226 [*1.342*]
ΔPD	-0.049 [*-0.984*]	-
ΔPD(1)	0.090 [*0.614*]	-
ΔPD(2)	-0.224* [*-1.900*]	-
ΔDPD	-	0.036 [*0.383*]
ΔDPD(1)	-	0.228** [*2.227*]
ΔDPD(2)	-	0.068 [*0.878*]
ΔFPD	-	0.078 [*1.160*]
ΔINV	0.567** [*2.114*]	0.101 [*0.318*]
ΔLBR	-0.183 [*-0.326*]	-0.181 [*-0.303*]
ΔLBR(1)	0.535 [*0.951*]	0.371* [*1.715*]
ΔLBR(2)	0.873 [*1.570*]	0.448 [*1.301*]
ΔFB	0.068 [*0.305*]	-0.424* [*-1.835*]
ΔFB(1)	-0.073*** [*-3.005*]	-0.344 [*-1.325*]
ΔFB(2)	-0.561** [*-2.442*]	-0.381 [*-1.629*]
ΔTOP	-0.091 [*-0.920*]	0.066 [*0.741*]
ΔTOP(1)	-	0.160* [*1.888*]
ΔTOP(2)	-	0.119 [*1.667*]
ΔSAV	0.330 [*1.578*]	0.284 [*1.641*]
ΔSAV(1)	0.318* [*1.803*]	-
ΔSAV(2)	0.419** [*2.565*]	-
ΔTOT	0.138 [*0.773*]	-0.072 [*-0.651*]

ΔTOT(1)	0.364 [*1.460*]	-
ΔTOT(2)	0.052 [*0.338*]	-
ECM(-1)	-0.341*** [*-4.126*]	-0.522*** *[-4.039*]
	Model 1	**Model 2**
R-squared	0.830	0.869
R-bar-squared	0.559	0.662
F-statistic	3.066	4.185
Prob[F-statistic]	0.010	0.002
DW statistic	2.037	1.831

*Note: *, ** and *** signify statistical significance at 10%, 5% and 1% levels, respectively.*

The empirical results for Model 1 show that public debt (PD) has a statistically significant and negative impact on economic growth (y) in the long run, while in the short run the impact varies with the timeframe considered. The coefficient of public debt in the current period (ΔPD) is statistically insignificant, implying that public debt has no immediate substantial impact on economic growth (y). However, public debt lagged by two periods (ΔPD(2)) has a statistically significant and negative relationship with economic growth in the short run. In the main, the results imply that a rise in aggregate public debt lowers economic growth in South Africa. Accordingly, the study cautions the country against growing the size of public debt stock. This research outcome is consistent with other previous results reported by Mhlaba and Phiri (2019), Huang *et al.* (2018), Gómez-Puig and Sosvilla-Rivero (2018), and Ncanywa and Masoga (2018), among others.

Other results for Model 1 reveal that investment (INV) and savings (SAV) have a statistically significant and positive impact on economic growth in South Africa, in the short run and in the long run. This finding is consistent with economic growth theory, which states that an increase in both savings and investment induces economic activity and expands tradable sectors (Elmendorf and Mankiw, 1999). The results further reveal that economic growth lagged once (Δy(1)) has a statistically significant and positive effect on economic growth in South Africa, in the short run; and that the coefficient of trade openness (TOP) is statistically significant and positive in the long run and statistically insignificant in the short run. Additionally, the findings of a statistically significant and negative relationship between labour (LBR) and fiscal balance (FB) and economic growth is contradictory to study expectations. The negative relationship between these variables may be due to the choice of proxies used. Finally, the coefficient of terms of trade (TOT) was found to be statistically insignificant in both the short run and long run.

The long-run results for Model 2 reveal that the general impact of disaggregated public debt on economic growth varies with the type of government debt under consideration and is time-variant. Although the long-run impact of foreign public debt (FPD) has a statistically significant and negative relationship with economic growth (y), the impact is statistically insignificant in the short run. However, while the impact of domestic public debt (DPD) on economic growth is statistically insignificant in the long run, domestic public debt lagged once (ΔDPD(1)) is statistically significant and positively related to economic growth in South Africa, in the short run. The outcome of this study supports the empirical evidence reported by other researchers such as Akram (2015). However, with regards to foreign public debt, the empirical evidence contradicts those reported in Akram (2016). According to Akram (2016), domestic public debt can crowd-in risky private sector investment and makes the banking system more efficient, leading to improved economic performance in the short run.

The other results for Model 2 reveal that investment (INV), labour (LBR), and savings (SAV) are statistically significant and positively related to economic growth, in the long run. More so, the coefficients of economic growth (Δy(1)), labour (ΔLBR(1)) and trade openness (ΔTOP(1)) are statistically significant and positive, implying that economic growth, labour and trade openness lagged by one period enhances economic performance in South Africa, in the short run. However, investment (ΔI), labour (ΔL), savings (ΔS) and terms of trade (ΔTOT) in the current period were found to have no significant impact on economic growth, in the short run. Unexpectedly, fiscal balance (FB) and trade openness (TOP) are have a statistically significant and negative relationship with economic growth in South Africa, in the long run. Finally, the ECM(-1) terms for the aggregated and disaggregated public debt models are all negative and statistically significant – which confirms the existence of the long-run relationship of all variables in the two models.

The empirical results reported in this paper show that the impact of the aggregated public debt on economic growth in South Africa is statistically significant and negative, both in the short run and in the long run. However, the impact of disaggregated public debt on economic growth varies depending on the type of government debt and timeframe considered. Whereas domestic public debt exhibits a statistically significant and positive impact on

economic growth in the short run only. Contrary, foreign public debt was found to be statistically significant and negatively related to economic growth in the long run only.

To check on the reliability of the results on public debt and economic growth models, four diagnostic tests were carried out, and the results are reported in Table 7.

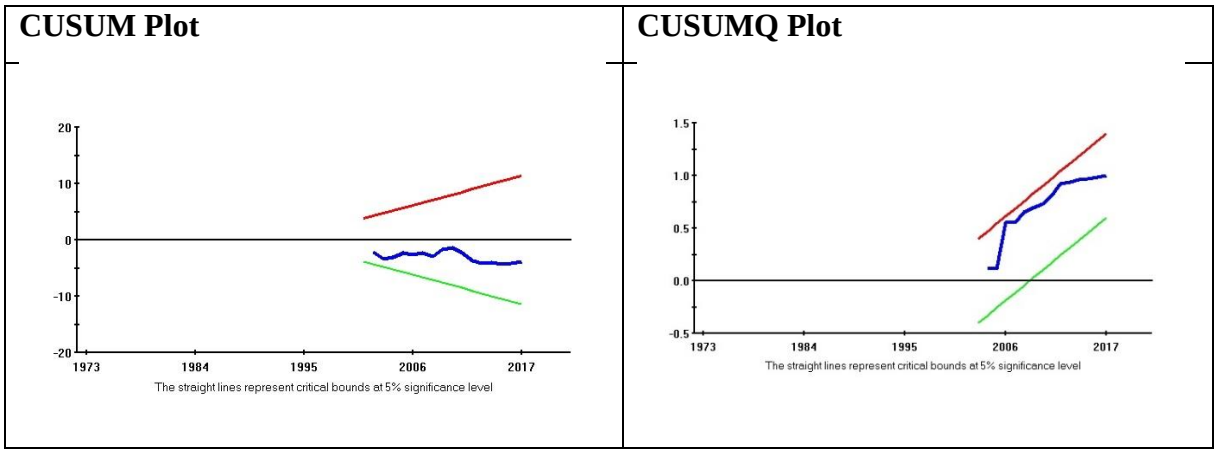
Table 7: ECM-ARDL diagnostic test – Models 1 and 2

	LM test statistic			
Results [Probability]	*Serial Correlation: CHSQ (1)*	*Functional Form: CHSQ (1)*	*Normality: CHSQ (2)*	*Heteroscedasticity: CHSQ (1)*
Model 1	0.068	4.861**	0.445	0.621
	[0.794]	[0.027]	[0.801]	[0.431]
Model 2	0.768	0.757	3.074	0.647
	[0.381]	[0.371]	[0.218]	[0.421]

*Note: * denotes statistical significance at 10% level.*

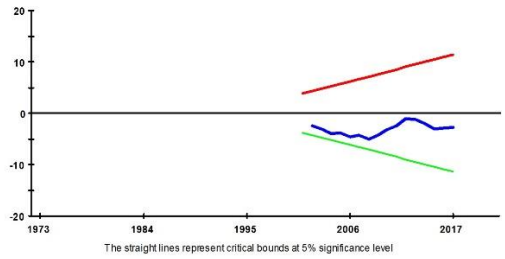
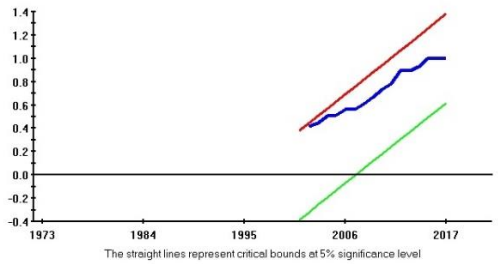
The results in Table 7 indicate that Model 1 passes three diagnostic tests, namely, serial correlation, normality and heteroscedasticity, but fails on the functional form. Model 2, however, passes all four diagnostic tests on serial correlation, functional form, normality and heteroscedasticity. The study proceeds to check for model stability by plotting the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMQ). The results of these tests are displayed in Figure 3 and Figure 4.

Figure 3: Plots of CUSUM and CUSUMQ – Model 1



Source: authors' computation by using Microfit 5.01 software

Figure 4: Plots of CUSUM and CUSUMQ – Model 2

CUSUM Plot	CUSUMQ Plot
	

Source: authors' computation by using Microfit 5.01 software

All the models pass the stability test as revealed by CUSUM and CUSUMSQ plots which are within the boundaries at 5% significance level, signifying that the estimated results are consistently reliable.

5. Concluding remarks and policy implications

The principal objective of this study was to empirically examine the impact of public debt on economic growth in South Africa for the period from 1970 to 2017. Unlike most previous studies, the study tested the impact of aggregated public debt on economic growth, in addition to estimating the relative impact of domestic and foreign public debt on economic growth. This approach makes this study to be among the first to investigate in detail the dynamic impact of public debt on economic growth in South Africa – using the ARDL model. The empirical findings from the study reveal that the impact of the aggregated public debt on economic growth in South Africa is statistically significant and negative, both in the short run and in the long run. The results further reveal that the impact of disaggregated public debt (domestic and foreign) on economic growth depends on the type of government debt and timeframe considered. Whereas domestic public debt has a statistically significant and positive impact on economic growth in the short run, the impact is statistically insignificant in the long run. Contrary, foreign public debt was found to be statistically significant and negatively related to economic growth in the long run but is insignificant in the short run. The study results, therefore, tend to support the crowding-out effect of both aggregated public debt and foreign public debt on economic growth in South Africa, in the long run. In line with the empirical evidence, the study recommends the South African government to pursue appropriate

domestic public debt policies and strategies with the intention of improving economic growth. However, the study cautions the country against growing foreign public debt to finance its increasing expenditure needs as this was found to have adverse effects on economic growth in the long run.

The implication of the study is that aggregate public debt and foreign public debt surveillance and management in South Africa should be enhanced in order to keep them within sustainable levels which do not cause future economic distress. More so, since investment and savings were found to be growth-enhancing, the country should pursue supportive policies that are aimed at increasing investment and savings.

Despite taking requisite measures to minimise model misspecification and improve the predictive power of the model, other important variables could have been included, such as, but not limited to, quality of public sector institutions and macroeconomic uncertainty. These variables were not considered in the study due to the nonexistence of reliable and consistent time-series data. When the data points of these variables become available for South Africa, it would be pertinent for future studies on the subject to investigate whether the results would change significantly after incorporating these variables. Further, some contemporary theoretical arguments suggest that the impact of public debt on economic growth could be nonlinear. Hence, it would be worthwhile for future studies to test the existence (or nonexistence) of nonlinear relationships between the variables – and thus validate for the existence of a "Debt Laffer" curve and ascertain the respective threshold points in this country. Lastly, while examining the impact of public debt (domestic and foreign) on both poverty rates and labour costs in South Africa is beyond the scope of this study, it is important for future research on the subject to move in this direction. This is imperative as high poverty rates and labour costs in developing countries can potentially lead to political and macroeconomic instability.

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