IMPACT OF TRADE OPENNESS ON ECONOMIC GROWTH: EMPIRICAL EVIDENCE FROM SOUTH AFRICA

ABSTRACT

This paper examines the impact of trade openness on economic growth in South Africa. The study employs the autoregressive distributed lag (ARDL) bounds testing approach to investigate the dynamic impact of trade openness on economic growth. Unlike some previous studies, the current study uses four proxies of trade openness, with each proxy addressing a different aspect of trade openness. The first proxy of trade openness is derived from the ratio of trade to gross domestic product (GDP). The second proxy is the ratio of exports to GDP, while the third proxy is the ratio of imports to GDP. The last proxy is an index of trade openness, which captures the effects of residual openness, resulting from taking the country’s size and geography into account. Based on the long run empirical results, this study finds that trade openness has a positive and significant impact on economic growth when the ratio of total trade to GDP is used as a proxy, but not when the three other proxies are employed. However, in the short-run, when the first three proxies of openness are used, the study finds trade openness to have a positive impact on economic growth, but not so when the trade openness index is employed. These results, therefore, suggest that the promotion of policies that support international trade is relevant in the South African economy.

Keywords: ARDL, Economic Growth, Exports, Imports, South Africa, Trade Openness

JEL Classification: C13, F43

RIASSUNTO

L’impatto dell’apertura commerciale sulla crescita: evidenze empiriche dal Sud Africa

Questa ricerca esamina l’impatto dell’apertura commerciale sulla crescita in Sud Africa utilizzando il test ARDL (Autoregressive Distributed Lag). A differenza di studi precedenti, il presente lavoro utilizza quattro indici di apertura commerciale, ciascuno dei quali ne rappresenta un aspetto diverso.
Il primo si ottiene dal rapporto commercio/PIL. Il secondo è rappresentato dal rapporto esportazioni/PIL, il terzo dal rapporto importazioni/PIL. L’ultimo è un indice di apertura commerciale che esprime gli effetti dell’apertura residuale ottenuta considerando la dimensione e le caratteristiche geografiche del paese. Sulla base di risultati empirici di lungo periodo questo studio rileva che l’apertura commerciale ha un effetto positivo significativo sulla crescita quando si utilizza l’indice ottenuto dal rapporto commercio totale/PIL, mentre tale effetto non emerge quando sono utilizzati gli altri tre indici.

I risultati dello studio evidenziano che, nel breve periodo, se si utilizzano i primi tre indici risulta un impatto positivo sulla crescita, mentre ciò non si verifica quando viene impiegato il quarto indice. Quindi si deduce che la promozione di politiche che supportano il commercio internazionale sono rilevanti per l’economia del Sud Africa.

1. **INTRODUCTION**

In the advent of growing international relations and economic integration, the relationship between trade openness and economic growth has become a topical debate. Over the past decades, different studies have sought to investigate relevance and the significance of trade openness on economic growth. Some of the existing studies on trade and growth find a very strong support for the proposition that trade openness has a positive impact on economic growth (Chang and Mendy, 2012; Rao and Rao, 2009; Karras, 2003). There are other studies, however, that argue that trade openness has little or no impact on growth (Eris and Ulasan, 2013; Babatunde, 2011). Then again, some studies investigating the link between trade openness and economic growth propose that trade openness has a negative impact on economic growth (Adhikary, 2011; Krugman, 1994). Based on existing literature, therefore, there is no clear consensus regarding the impact of trade openness on economic growth. Moreover, previous studies including those conducted in South Africa, measure trade openness in several different ways based on their choice of proxies (see Sikwila et al., 2014; Menyah et al., 2014; Zahonogo, 2017).

Against this background, the purpose of the current study is to examine the dynamic relationship between trade openness and economic growth in South Africa over the period 1975 to 2014. This study differs from other studies conducted in South Africa in that, in addition to the three commonly used trade-based indicators of openness, the current study employs an
index of trade openness that takes into account the country size and geography. Country size and geography can affect the country's trade size, hence the impact of trade openness on economic growth (Frankel and Romer, 1999). The other difference between this study and previous studies conducted in South Africa is that this study uses the Auto Regressive Distributed Lag (ARDL) modelling technique, following Pesaran et al. (2001). The ARDL technique has been proven to perform better in smaller samples (Tang, 2004), hence its adoption in the current study. The use of the ARDL technique in this study also allows for the estimation of the short-run and long-run effects of trade openness on economic growth.

The rationale behind the current study focusing on South Africa is that the country has gone through different episodes of economic reforms over the past years. Among other things, these reforms have shaped the landscape of South Africa’s trade policy. As pointed out by Rangasamy (2009), South Africa’s new trade policy is geared towards the implementation of outward oriented measures, which are essential in assisting the country to liberalise its trade. Therefore, given that South Africa has attempted to open up its economy to trade, the current study aims to establish whether increased trade openness has any significant impact on economic growth in the country. The empirical findings of this study also add to the existing body of literature on openness and economic growth in Sub-Saharan Africa.

This paper is organised into five sections. After the introduction, Section 2 provides an overview of trade openness and economic growth in South Africa, while Section 2 reviews literature on trade openness and economic growth. Section 4 discusses the methodology used and the empirical results for the study. Section 5 concludes the paper.

2. TRADE OPENNESS AND ECONOMIC GROWTH IN SOUTH AFRICA: HISTORICAL OVERVIEW

Like other economies in Sub-Saharan Africa, the Republic of South Africa (RSA) has experienced transformations in its trade and growth policies over the past decades. During the early years of the past century, South Africa’s trade sector was characterised by some conditions that made it difficult for local industries to find sufficient markets in the country. In particular, the local industries experienced high costs of raw materials and skilled labour, which hindered the growth of these industries (RSA, 1912). Realising these adverse conditions, the government of South Africa, through the recommendations of the Sir Thomas Cullinan Commission, took steps to
provide further protection to the local industries against competition from the foreign industries. At that time, South Africa adopted the import substitution industrialisation as a strategy for economic growth and development. During the early years of import substitution industrialisation, South Africa applied prohibitive rates of customs duty based on the rates set in the maximum duty column of the First Schedule to the 1925 Customs and Duty Act of South Africa (RSA, 1925). The First Schedule of the Act presented duty rates for fifteen different classes of imports consisting of goods from agriculture, manufacturing and mining sectors. The Act also made provision for some goods to be admitted free of customs duty on condition that such goods are imported for use in manufacturing industry only.

Following the implementation of the 1925 Customs and Duty Act of South Africa, the country continued with the inward-oriented strategy. This inward-oriented strategy controlled the imports mainly through the use of protectionist tariffs (Matthews and Douwes Dekker, 1983). However, the use of the protectionist tariffs as the main instrument of industrial protection in South Africa lasted only until 1948. This was because in 1948, quantitative restrictions were introduced as the main instrument of industrial protection (Jenkins et al., 1995). The system of quantitative restrictions involved the use of import permits as well as annual quotas for selected products. In 1949, South Africa introduced some trade reforms, following the country's new membership to the General Agreement on Tariffs and Trade (GATT). The GATT's mandate is that member countries should enter into arrangements directed to the substantial reduction of tariffs and other barriers to trade (World Trade Organisation “WTO”, 1986: 1). Subsequently, South Africa moved to the use of import licensing as the main instrument of industrial policy in place of tariff protection. The import licensing system seemed fit during the 1940s when South Africa was experiencing a continuing deterioration in its balance of payments. With the new system of import licensing, about three-quarters of imports to South Africa were subjected to licensing with occasional imposition of a few import quotas (Fine and Rumstojee, 1996). This system of import licensing lasted until the early 1980s.

In 1972, driven by the desire to shift away from import substitution industrialisation and towards export-oriented industrialisation, South Africa established the Commission of Inquiry into Export Trade of the Republic of South Africa – the Reynders Commission. One of the highlights of the Reynders Commission was the need for the South African economy to diversify the exports from manufactured exports into non-gold exports in general (Bell, 1992). The
objective of moving the economy away from import substitution required the country to implement some new measures in its trade policy. The new measures that South Africa adopted as part of the policy shift away from the import substitution industrialisation included the relaxation of quantitative restrictions, reduction of tariffs, devaluation, and direct export promotion measures (Bell, 1997). Despite the adoption of these new measures that aimed at export promotion, South Africa experienced a deteriorating international competitiveness, possibly exacerbated by a volatility in the rand, among other factors.

As part of the intermediate remedies to economic crises of the time, the dual exchange rate system was later introduced in South Africa in 1985. The main aim for imposing the dual exchange rate system in South Africa at that time was to separate the foreign exchange transactions of non-resident portfolio investors from all other foreign exchange transactions (Farrel, 2001). In the light of deteriorating international competitiveness experienced during the 1980s together with the need to establish an employment-creating international competitiveness, South Africa recognised the need to restructure its trade and industrial policies further, particularly with more inclination on tariff reforms and supply-side measures. Thus, with the new political dispensation commencing from 1990, the new government of South Africa aimed at economic restructuring with the emphasis on job creation and economic growth as some of the key issues (Department of Trade and Industry “DTI”, 1990). Consequently, the government introduced a package of supply-side measures in view of stimulating industrial investment, job opportunities and exports.

In 1996, The Growth, Employment and Redistribution Strategy (GEAR) was introduced in South Africa, with the aim to create a competitive fast-growing economy. In the medium term, some of the trade and industrial policies had to go through reforms. In the GEAR strategy, the South African government emphasises the need for a policy shift away from the demand-side interventions such as tariffs and subsidies, as these interventions are detrimental to international trade through their effect on prices received by producers (RSA, 1996 p.12). Thus, driven by the desire to achieve a stronger competitiveness of domestic industries, as well as to achieve greater export promotion, the reforms in South Africa’s trade policy that took place during the 1990s can be seen as favouring export promotion. Among others, these reforms include a variety of incentives, tariff concessions, credit facilities, financial assistance and guarantee facilities (WTO, 1998).
**Figure 1 - Trends in Trade Openness and Economic Growth in South Africa, 1960-2016**

*(a) Economic Growth*

![GDP per capita growth](image)

*Source: Constructed from World Bank World Development Indicators (2016).*

*(b) Trade Openness*

![Trade openness](image)

*Source: Constructed from World Bank World Development Indicators (2016).*
Figure 1 shows the trends in trade openness and economic growth in South Africa between 1960 and 2016. Trade openness is expressed as the ratio of exports plus imports to gross domestic product (GDP), while economic growth is measured by the rate of growth on the real GDP per capita.

The trend depicted in Figure 1(a) shows that South Africa’s economic growth, based on GDP per capita growth, was exceptionally high during the 1960s, relative to where it is in the current decade. Between 1960 and 1969, economic growth reached its peak in 1964 where 7.9% growth rate was recorded (World Bank, 2016). However, South Africa’s economic growth deteriorated from 5.2% in 1970 to 3.8% in 1979. By 1985, economic growth had worsened to -1.2%. Although there were some recoveries in economic growth between 1986 and 1988, a further decline in South Africa’s economic growth occurred from 1989 until 1992, after which economic growth averaged 2.8% between 1993 and 2003. During a five-year period between 2004 and 2008, South Africa’s economic growth improved quite significantly until a slump occurred in 2009, following the global economic recession. In recent years, particularly during the last five years from 2012 to 2016, South Africa’s economic growth has remained below 3%, with 2016 experiencing only 0.27% economic growth rate (World Bank, 2016).

Concerning trade openness, Figure 1(b) shows a downward trend in trade openness during the 1960s, followed by an upward trend during the 1970s. This upward trend in trade openness coincides with the period after the implementation of export promotion industrialisation in South Africa, which was incepted in 1972. South Africa’s trade openness, however, declined considerably during the early 1980s and again during the early 1990s, particularly between 1990 and 1992. However, from 1993 onwards, trade openness showed a steady upward trend, reaching a peak of 72.9% in 2008. Following the decline in the world trade as a result of the 2008 global recession, South Africa’s trade openness dropped sharply to 55.4% in 2009, before rising again in 2010. During the period between 2011 and 2016, South Africa’s trade openness has remained slightly above 60% (World Bank, 2016).

Looking at the recent trends in trade openness and economic growth, particularly during the last fifteen years, Figure 1 reveals that trade openness in South Africa increased from 37% in 1992 to 60% in 2016. On the contrary, economic growth grew from -4% in 1992 to -1% in 2016. Among other factors, the decline in the real output of the mining and manufacturing sectors led to the contraction in the real economic growth in South Africa, especially in 2016 (SARB, 2017).
3. **LITERATURE REVIEW**

3.1 *Theoretical Review*

Before the advent of the new trade theories, some of the postulates in international trade theories were as a result of, among others, the contributions made by Ricardo, Heckscher, Ohlin and Samuelson. To start with, the Ricardian model of trade considers technological differences as the main factor causing international trade (Krugman, 1987: 132). In contrast, the Heckscher-Ohlin-Samuelson model attributes international trade to differences in factors endowments. Hence, the expansion of international trade opportunities is likely to support growth in labour-intensive export industries (Ahmed and Sattar, 2004: 1).

Even though the classical theories of international trade brought into being the models of international trade, these theories were developed under the assumption of perfect competition and constant returns to scale. By allowing for perfect competition, the gains from trade would then result in the form of increased efficiency (Havrlyshyn, 1990). However, the validity of perfect competition of international trade models was later challenged by new theories of international trade including Krugman (1979, 1981). There are reasons why the new theories of international trade refute the idea of perfectly competitive markets. With the new theories, markets are assumed to operate under the condition of imperfect competition. This imperfect competition comes as a result of economies of scale (Krugman, 1981: 971). The existence of economies of scale makes it possible for countries to realise some gains from trade. These gains from trade arising from economies of scale could be in the form of increased welfare in the countries involved in trade (Krugman, 1979: 476).

The new theories, including the endogenous growth theory, support the view that trade openness has a positive influence on economic growth. For instance, Romer (1990) argues that free international trade tends to speed up economic growth. Within the endogenous growth framework, one of the ways through which trade openness is believed to affect economic growth is the transmission of technology (Karras, 2003). Thus, technology transfers and other factor movements are more possible in an open compared to a closed economy. Drawing on an argument from the endogenous growth theory, Adhikary (2011: 17) posits that trade openness may affect economic growth by facilitating flows of international capital as well as by redirecting factor endowments to more productive sectors.
Apart from facilitating factor movement and capital flows, trade openness can also affect economic growth through its effect on labour productivity and export capability. In this view, an economy that is more open to trade is inclined to have increased specialisation and division of labour, thus improving productivity and export capability (Constant and Yaoxing, 2010: 99). In some cases, the connection between trade openness and economic growth has been associated with the effect of trade openness on foreign investment. In this view, it is believed that a higher degree of trade openness allows more foreign investment inflows (Osabuohien, 2007).

Because of the developments in trade and growth literature, different channels that link trade openness with economic growth have been identified. For instance, in some situations, particularly in developing countries, the act of opening up to trade through the reduction in the restrictiveness of trade regimes has resulted in rapid economic growth. This is so because the growth of developing countries in part relies on their ability to import, especially the capital goods, investments and other intermediate goods and services (Krueger, 1998). This situation offers a possible explanation to why some developing countries have over the past decades introduced measures that aimed at relaxing the restrictiveness of their trade regimes towards more open trade regimes. One of the arguments in favour of trade openness is that when an economy is more open to trade, the more likely it is for the national per capita income to increase. This is because increased trade openness encourages investment, which in turn leads to increased economic growth in the long run (Klasra, 2011).

In support of the evidence that trade openness plays an important role in economic growth, Wacziarg and Welch (2008:1) showed that by the year 2000, 73% of world economies had opened up to international trade compared to 22% in 1960. Empirical evidence also shows that trade openness does not only increase per capita income, but also assists in the attainment of steady-state convergence in income. Sachs and Warner (1997a: 187) argued that economies that are more open to trade experience faster income convergence compared to closed economies. This difference in income convergence between open economies and closed economies arises because of the role played by trade openness in the movement of factor endowments, particularly capital and technology. Most importantly, trade openness facilitates a faster movement of capital and technological transfers (Adhikary, 2011). Thus, the more open the economy is, the greater the ability to implement technological innovations from more productive trading partners, and hence the higher economic growth (Karras, 2003). Eventually,
the capital inflows and technological transfers become a vital channel through which trade openness impacts on economic growth.

In some cases, trade openness has been found to affect economic growth through its effect on specialisation of labour and labour productivity. For instance, Hassan (2005) argued that trade openness accelerates economic growth by increasing specialisation and productivity level. Moreover, in more open economies, labour productivity has been proven to have more impact on economic growth (Dar and Amirkhalkhali, 2003).

Lastly, the other way through which trade openness affects economic growth is by allowing countries to be more internationally competitive in governance. In this regard, efforts by countries to remove barriers to international trade make it imperative for governments to also adjust services from their institutions of governance in order to enhance long-run economic growth (Skipton, 2007). Thus, as countries gain some international competition in governance, there is likelihood for increased capital inflows to occur that would drive up economic growth in the long run.

3.2 Empirical Evidence from Sub-Saharan Africa

In this section we review some of the studies on trade openness and economic growth in South Africa and in Sub-Saharan Africa. All the cross-sectional studies that are reviewed in this section include South Africa. Sachs and Warner (1997) examined the sources of slow economic growth in Sub-Saharan Africa during 1960-1990, using the cross-country growth model. The study found that openness to international trade has a significant impact on economic growth in Sub-Saharan Africa.

Jonsson and Subramanian (2001) used trade protection data from manufacturing sector in South Africa to investigate whether there are any dynamic gains from trade in the country. The results revealed a significant positive long-run relationship between trade openness and total factor productivity in South Africa. Based on these results, therefore, it can be concluded that trade supports economic growth in South Africa.

In another study, Gries et al. (2009) tested for causality between financial deepening, trade openness and economic development in 16 Sub Saharan African countries. Using the Hsiao-
Granger causality approach, the results indicated a significant unidirectional causality running from trade openness to economic growth. These findings suggest that there is a very strong link between trade openness and economic growth in South Africa.

Menya et al. (2014) used the panel bootstrapped approach to Granger causality to investigate the effects of trade openness on economic growth in Sub-Saharan Africa during the period 1965-2008. For South Africa, the results showed that there is a unidirectional causality running from trade openness to economic growth, which suggests that increased trade openness in the country is likely to lead to higher levels of economic growth.

Zahonogo (2017) employed a dynamic growth model in the empirical investigation of the effects of trade openness on economic growth in Sub-Saharan Africa (SSA). Using data covering the period 1980 to 2012 in 42 SSA countries, the study found that there exists a trade threshold below which increased trade openness have beneficial effects on economic growth and above which the effects of trade openness on economic growth tend to decline.

Chang and Mendy (2012) investigated the empirical relationship between trade openness and economic growth in Sub-Saharan Africa using the fixed-effects panel regression models. The results showed that there is a significant positive relationship between trade openness and economic growth, which suggests that openness to international trade has a significant positive impact on economic growth in Sub-Saharan African economies. Based on the reviewed studies, therefore, empirical evidence suggests that trade openness plays a significant role in Sub-Saharan Africa, including South Africa.

4. MODEL SPECIFICATION AND ESTIMATION TECHNIQUES

4.1 Model Specification and Variable Description

To estimate the impact of trade openness on economic growth in South Africa, we follow Jin (2000) for the general model specification and Yanikkaya (2003) to introduce the three trade-based proxies for trade openness. We also incorporate the fourth proxy, which is an index of trade openness, which measures residual openness after taking country size and geography into account. Therefore, the proxies used in this study are the ratio of total trade to GDP, the ratio of real exports to GDP, the ratio of real imports to GDP, and the trade openness index.
The decision to use the ratios of total trade to GDP, exports to GDP, and imports to GDP, was motivated by previous empirical investigations including those by Yanikkaya (2003), and Chang and Mendy (2012). Although previous studies on trade openness and economic growth have developed various indicators of trade openness, the current study uses the trade-based ratios to GDP given their advantages. Among other advantages, by virtue of their definition, the trade based-ratios indicate the intensity of a country’s trade in relation to its production capacity.

The first proxy of trade openness, which is the ratio of total trade to GDP, serves as a vital indicator since it represents the importance of trade in the success of an economy, particularly in a modern economy (Department for Business Innovation and Skills, 2014). In this view, the ratio of total trade to GDP is expected to have a positive impact on economic growth. The second proxy, which is the ratio of imports to GDP, has the advantage of signifying the degree of protection in an economy. This particular measure of trade openness is considered to be a more appropriate measure of trade openness (Jin, 2000). The ratio of exports to GDP, which is the third proxy of trade openness, indicates the impetus on economic growth that comes from the exports sector. The role of the exports sector in economic growth has been widely acknowledged in literature (for example, see Balassa 1982; Ukpalo 1994; Awokuse 2008; Menyah et al., 2014).

The fourth proxy, which is an index of trade openness, is derived from information on country size and location. The advantage of using this index is that it takes into account country size and geography. Frankel and Romer (1999) consider countries’ geography and size as being meaningful in the estimation of the impact of trade on economic growth since country size and geography affect trade sizes. By controlling for country size and geography in this study, the impact of trade openness on economic growth can be estimated\(^1\).

The general empirical model that is used to test the impact of trade openness on economic growth is specified as follows:

\[ TOI = \alpha_0 + \alpha_1 y_i + \alpha_2 Area_i + \alpha_3 Pop_i + u_i; \]

where \(y_i\) is GDP per capita; \(\alpha_0\) is the constant, \(Area_i\) is the measure for country size; \(Pop_i\) is the population size in country \(i\); while \(u_i\) is the error term. \(\alpha_1\), \(\alpha_2\) and \(\alpha_3\) are the respective coefficients of GDP per capita, country size, and population size. The residuals from the regression are then used as proxy variables representing trade openness.

\(^1\) Following UNCTAD (2012), an index of trade openness (TOI) is constructed using this regression: \(TOI = \alpha_0 + \alpha_1 y_i + \alpha_2 Area_i + \alpha_3 Pop_i + u_i\); where \(y_i\) is GDP per capita; \(\alpha_0\) is the constant, \(Area_i\) is the measure for country size; \(Pop_i\) is the population size in country \(i\); while \(u_i\) is the error term. \(\alpha_1\), \(\alpha_2\) and \(\alpha_3\) are the respective coefficients of GDP per capita, country size, and population size. The residuals from the regression are then used as proxy variables representing trade openness.
\[ GROWTH = \alpha_0 + \beta_1 OPEN + \beta_2 INV/GDP + \beta_3 GOV/GDP + \beta_4 INFL + \beta_5 M2/GDP + \epsilon_t \]  

(1)

Where:

- \( GROWTH \) is the growth rate in the real GDP per capita;
- \( OPEN \) is a measure of trade openness with \( GROWTH \) as the dependent variable. Apart from the trade openness variable, the control variables are investment (\( INV/GDP \)); government consumption expenditure (\( GOV/GDP \)); inflation rate (\( INFL \)), and the level of financial development (\( M2/GDP \)). The term \( \epsilon_t \) is the error term while \( \alpha_0 \) is the constant term. \( \beta_1 \ldots \beta_5 \) are the regression coefficients.

To arrive at the general specification of the empirical model for the current study, the following modifications were made to the Jin (2000) model: first, investment variable (\( INV/GDP \)) was introduced to the model. The inclusion of investment variable in the empirical model was driven by the trade-induced investment-led growth hypothesis, according to which trade may affect growth through investment channel. According to Baldwin and Seghezza (1996), increased trade openness could reduce the cost of capital thereby resulting in an increase in the demand for capital as well as on the return on investment. Subsequently, the return on investment would increase, leading to trade-induced investment-led growth. The other reason for inclusion of investment in the current specification is that investment is considered to be one of the factors that affect economic growth in Sub-Saharan Africa (Hadjimichael and Ghura, 1995).

Apart from introducing investment variable to the model, the other modification to the original model by Jin (2000) is the inclusion of a different indicator of financial development, (\( M2/GDP \)), in place of \( M1 \). The third modification made to the original model involves the inclusion of inflation rate (\( INFL \)) in place of foreign shock. The inclusion of \( M2/GDP \) and \( INFL \) in the current investigation follows Bittencourt et al. (2015), who identified \( M2/GDP \) ratio and inflation rate as being significant factors in influencing economic growth in a group of 15 Sub-Saharan African countries that also included South Africa.

In line with Pesaran et al. (2001), the ARDL specification of this study is specified as follows:
In order to carry out the ARDL bounds testing procedure, there are two stages involved. The first stage involves the testing of cointegration relationship. The rationale behind the cointegration test at this stage is to establish whether there exists a linear combination for the nonstationary processes.

Using the parameters expressed in equation (2), it follows that the null hypothesis testing for no cointegration is given by:

$$H_0: \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = \lambda_6 = 0$$

which is tested against the alternative hypothesis:

$$H_1: \lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda_4 \neq \lambda_5 \neq \lambda_6 \neq 0$$

The outcome of the cointegration test is determined by the computed F-statistic, which is compared to the critical values tabulated in Pesaran et al. (2001). This F-statistic has a non-standard distribution, irrespective of whether the regressors are integrated of order zero $I(0)$; or integrated of order one, $I(1)$ (Pesaran and Pesaran 2009: 308). There are two sets of critical value bounds for the F-test: the first one assumes that all the variables in the ARDL model are $I(0)$, while the other set assumes that all the variables are $I(1)$. The decision to reject the null hypothesis of no cointegration is made on the basis of whether the computed F-statistic falls outside or within the critical value bounds. The second stage of the ARDL modelling involves the estimation of the coefficients of the long-run relationships as well as drawing inference on the values of the estimated coefficients. In this stage, the optimal lag length for the ARDL model is selected with the use of suitable lag selection criteria such as the Akaike Information Criterion (AIC) or the Schwartz-Bayesian Criterion (SBC).

One of the advantages of using the ARDL approach to cointegration is that the power of this test does not suffer in finite samples when invalid restrictions are imposed as is the case with the Engle Granger (1987) approach and the Hansen (1990) cointegration test (Banerjee et al., 1998).
As a result of its finite sample properties, the ARDL bounds testing approach to cointegration performs better even in smaller samples. Consequently, in the presence of a smaller sample size, the bounds testing approach to cointegration is preferable since it is robust for small samples (Tang, 2004).

Following the cointegration test based on equation (2), the error correction model (ECM) for the current study is specified as follows:

$$
\Delta GROWTH_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta GROWTH_{t-i} + \sum_{i=1}^{n} \alpha_{2i} \Delta OPEN_{t-i} + \sum_{i=1}^{n} \alpha_{3i} \Delta INV/GDP_{t-i} \\
+ \sum_{i=1}^{n} \alpha_{4i} \Delta GOV/GDP_{t-i} + \sum_{i=1}^{n} \alpha_{5i} \Delta INF_{t-i} + \sum_{i=1}^{n} \alpha_{6i} \Delta M2/GDP_{t-i} + \varphi ECT_{t-1} + \mu_t
$$

(3)

In equation 3, $\Delta$ is the difference operator; $n$ is the lag length; $\alpha_0$ is a constant; and $\alpha_1, \ldots, \alpha_n$ are the short-run coefficients; while $\varphi$ is the coefficient capturing the long-run dynamics. $ECT$ is the error-correction term, whereas $\mu_t$ is the residual error term.

4.2 Data Type and Sources

In this study, economic growth is treated as the dependent variable in the growth equation, which is measured by the growth rate in real GDP per capita. In addition to the dependent variable, five independent variables are included in the growth equation for this study. These variables include trade openness, investment, government consumption expenditure, inflation rate, and financial development. Four different indicators of trade openness are used in this study, which are OPEN 1, OPEN 2, OPEN 3, and OPEN 4. OPEN 1 is the ratio of total trade to GDP; OPEN 2 is the ratio of exports to GDP, while OPEN 3 is the ratio of imports to GDP. OPEN 4 is the trade openness index derived from a regression equation involving per capita GDP, country size and population size following with modifications the approach by Frankel and Romer (1999) and UNCTAD (2012). In addition to the trade openness variable, there are four other explanatory variables in the empirical model. These are investment (INV/GDP), government consumption expenditure (GOV/GDP), inflation rate (INFL), and financial development variable (M2/GDP). The World Bank World Development Indicators (2016) was used as the source of data. This study uses annual time series data covering the period 1975 to 2014.
4.3 Estimation Techniques

The variables were first tested for the presence of unit roots. Unit root tests allow for determining whether times series is stationary or not. If a particular series is stationary, then the mean, variance and autocorrelations can be well approximated using long-time averages based on a single set of realisations (Enders, 2004). However, if a series is nonstationary, it will tend to drift away from its long-run mean, which could lead to inference being based on spurious results. This study employs the Dickey Fuller test with GLS detrending, Phillip-Perron test, and the Perron (1997) test. The results of these unit root tests are reported in Table 1.

Based on the stationarity test results reported in Table 1, it can be concluded that economic growth is integrated of order zero, whereas trade openness, investment, government consumption, inflation rate, and financial development are integrated of order one. The unit root test results further indicate that after first differencing, all the variables that were non-stationary in levels became stationary. The results, therefore, show that the variables used in the study are integrated of order zero or order one. Having confirmed the order of integration of the variables, the ARDL bounds test for cointegration was performed in order to establish if there is any long-run relationship among the variables. The results of the ARDL bounds test are reported in Table 2.

Based on the cointegration test results reported in Table 2, it is evident that for Model 1, Model 2 and Model 3, the calculated F-statistics are higher than the upper critical value bounds at 5% level of statistical significance. For Model 4, the calculated F-Statistic is higher than the upper critical value bound at 10% level. These results show that both the Pesaran et al. (2001) cointegration test and the Narayan (2005) test confirm that there is cointegration in all the four models used in the empirical investigation of this study.

Following the cointegration test, the estimation of the long-run and the short-run coefficients for the model was carried out. The optimal lag length was determined using the Schwartz Information Criterion (SIC). The SIC selected ARDL(2, 0, 1, 2, 2, 0) for Model 1; ARDL(2,0,1,2,2,0) for Model 2; ARDL(1, 1, 0, 0, 0, 0) for Model 3; and ARDL(1, 0, 0, 2, 0, 0) for Model 4. Table 3 reports the empirical results for the four models of this study.
### Table 1 - Stationarity Tests for all Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Dickey-Fuller GLS</th>
<th>Phillip-Perron</th>
<th>Perron (1997)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stationarity of all Variables in Levels</td>
<td>Stationarity of all Variables in First Difference</td>
<td>Stationarity of all Variables in Levels</td>
</tr>
<tr>
<td></td>
<td>No trend</td>
<td>Trend</td>
<td>No trend</td>
</tr>
<tr>
<td>GROWTH</td>
<td>-3.870***</td>
<td>-4.166***</td>
<td>-</td>
</tr>
<tr>
<td>OPEN1</td>
<td>-1.692*</td>
<td>-1.910</td>
<td>-</td>
</tr>
<tr>
<td>OPEN2</td>
<td>-2.228**</td>
<td>-2.247</td>
<td>-</td>
</tr>
<tr>
<td>GOV/GDP</td>
<td>-0.758</td>
<td>-1.923</td>
<td>-4.686***</td>
</tr>
</tbody>
</table>

Note: *, ** and *** denote statistical significance at 10%, 5% and 1% levels respectively.
### Table 2 - ARDL Bounds Test Results

<table>
<thead>
<tr>
<th>Model</th>
<th>Dependent Variable</th>
<th>Calculated F-Statistic</th>
<th>Cointegration Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1</td>
<td>GROWTH</td>
<td>4.543 **</td>
<td>Cointegrated</td>
</tr>
<tr>
<td>Model 2</td>
<td>GROWTH</td>
<td>5.419**</td>
<td>Cointegrated</td>
</tr>
<tr>
<td>Model 3</td>
<td>GROWTH</td>
<td>5.534**</td>
<td>Cointegrated</td>
</tr>
<tr>
<td>Model 4</td>
<td>GROWTH</td>
<td>3.384*</td>
<td>Cointegrated</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel A: Pesaran <em>et al.</em> (2001), p.300, Table CI(iii), Case III</th>
<th>1%</th>
<th>5%</th>
<th>10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>I(0) I(1)</td>
<td>3.41</td>
<td>4.68</td>
<td>2.62</td>
</tr>
</tbody>
</table>


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

The results for the long-run coefficients, which are reported in Table 3, show that trade openness has a significant positive impact on economic growth only in the case of Model 1. This shows that an increase in the ratio of total trade to GDP in South Africa has a positive impact on economic growth in the country. The long-run results also reveal that the coefficient of investment variable is negative and statistically significant in the cases of Model 1 and Model 3. These results indicate that increases in gross investment in physical capital have not effectively stimulated economic growth in South Africa, but rather slow it down. This could be due to a number of reasons. Among others, it is possible that the even though gross investment has been increasing in South Africa, generally, there have been sharp decreases in the pace of the growth rate in the real fixed capital formation by the private sector in recent years (see South African Reserve Bank “SARB”, 2014a). In particular, due to the declines in the manufacturing sector outlays, the pace of growth in the real fixed capital formation by the private firms in South Africa has deteriorated during the past recent years (SARB, 2014a). On the other hand, South Africa’s economic growth has been growing at a much slower rate compared to where it was before 2008 (see SARB, 2014b, p.25). Although the negative coefficient of the investment variable contradicts
the expectations of this study, these results are consistent with the findings of Nyasha and Odhiambo (2015), and Chang and Mendy (2012), who found a negative relationship between investment and economic growth in South Africa and in Sub-Saharan Africa respectively.

The long-run results of the current study further show that the coefficient of government consumption expenditure is negative and statistically significant. This implies that government consumption expenditure has a negative impact on economic growth in South Africa. The results indicating a negative effect of government consumption expenditure on economic growth are consistent with Landau (1983). Based on Model 3 and Model 4, the long-run results reveal that the coefficient of inflation rate is negative and statistically significant. This indicates that inflation rate has a negative impact on long-run economic growth in South Africa. This finding is consistent with Hodge (2006), who indicated that inflation hinders economic growth in South Africa. The long-run results also show that the coefficient of the proxy for financial development, (M2/GDP), is insignificant in all the models.

The results for the short-run coefficients show that the coefficient of trade openness is positive and statistically significant in the cases of Model 1, Model 2 and Model 3. These results suggest that an increase in the ratio of total trade, exports or imports to GDP results in an increase in economic growth in South Africa. These results show the importance of international trade activities in South Africa’s economic growth. The short-run results further show that, depending on the model used in the analysis, the coefficients of government expenditure and inflation rate are negative and statistically significant. The negative signs of these short-run coefficients are consistent with the expectations of this study. Other short-run results reveal that in all the four models, the lagged coefficient of the error correction term is negative and is statistically significant. This is an indication that in all the models used in this study, there exists a long-run relationship among the variables.

Following the long-run and short-run estimations, the plots for cumulative sum of recursive residuals (CUSUM) and the plots for the cumulative sum of squared residuals (CUSUMQ) are examined. Figure 2 shows the CUSUM and CUSUMQ plots, which provide further insights on the stability of the model.
**TABLE 3 - Results of the Long-Run and Short-Run Estimations of the ARDL (All Models)**

### Panel 1: Long-run Coefficients, Dependent Variable is GROWTH

<table>
<thead>
<tr>
<th>Regressor</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>Probability</td>
<td>Coefficient</td>
<td>Probability</td>
</tr>
<tr>
<td>OPEN</td>
<td>0.188* (2.037)</td>
<td>0.052</td>
<td>0.241 (1.697)</td>
<td>0.101</td>
</tr>
<tr>
<td>INV/GDP</td>
<td>-0.449** (-2.084)</td>
<td>0.047</td>
<td>-0.344 (-1.692)</td>
<td>0.102</td>
</tr>
<tr>
<td>GOV/GDP</td>
<td>-0.941** (-2.240)</td>
<td>0.033</td>
<td>-0.844** (-1.960)</td>
<td>0.060</td>
</tr>
<tr>
<td>INFL</td>
<td>0.033 (0.262)</td>
<td>0.795</td>
<td>0.066 (-0.548)</td>
<td>0.588</td>
</tr>
<tr>
<td>M2/GDP</td>
<td>0.032 (0.498)</td>
<td>0.622</td>
<td>0.055 (0.886)</td>
<td>0.383</td>
</tr>
<tr>
<td>C</td>
<td>14.615 (1.666)</td>
<td>0.107</td>
<td>13.640 (1.482)</td>
<td>0.150</td>
</tr>
</tbody>
</table>

### Panel 2: Short-run coefficients, Dependent variable is ΔGROWTH

<table>
<thead>
<tr>
<th>Regressor</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>Probability</td>
<td>Coefficient</td>
<td>Probability</td>
</tr>
<tr>
<td>ΔGROWTH(1)</td>
<td>-0.090 (-0.629)</td>
<td>0.534</td>
<td>-0.110 (-0.712)</td>
<td>0.482</td>
</tr>
<tr>
<td>ΔOPEN</td>
<td>0.182** (2.626)</td>
<td>0.013</td>
<td>0.236** (2.088)</td>
<td>0.045</td>
</tr>
</tbody>
</table>
Table 3 - continued

<table>
<thead>
<tr>
<th></th>
<th>∆INV/GDP</th>
<th>0.123 (0.425)</th>
<th>0.674</th>
<th>-0.233 (-1.641)</th>
<th>0.110</th>
<th>-0.225 (-1.162)</th>
<th>0.254</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>∆GOV/GDP</td>
<td>-0.961** (-2.397)</td>
<td>0.023</td>
<td>-0.831* (-1.878)</td>
<td>0.070</td>
<td>-0.834*** (-2.818)</td>
<td>0.008</td>
</tr>
<tr>
<td></td>
<td>∆GOV/GDP(1)</td>
<td>-0.710* (-1.809)</td>
<td>0.080</td>
<td>-0.802* (-1.979)</td>
<td>0.057</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td></td>
<td>∆INFL</td>
<td>-0.171 (-1.293)</td>
<td>0.206</td>
<td>-0.182 (-1.272)</td>
<td>0.213</td>
<td>-0.159* (-1.951)</td>
<td>0.060</td>
</tr>
<tr>
<td></td>
<td>∆INFL(1)</td>
<td>-0.427*** (-2.73)</td>
<td>0.010</td>
<td>-0.369** (-2.340)</td>
<td>0.026</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td></td>
<td>∆M2/GDP</td>
<td>0.031 (0.486)</td>
<td>0.631</td>
<td>0.054 (0.851)</td>
<td>0.401</td>
<td>0.070 (1.233)</td>
<td>0.226</td>
</tr>
<tr>
<td></td>
<td>ECM(-1)</td>
<td>-0.969*** (-4.372)</td>
<td>0.000</td>
<td>-0.982*** (-4.231)</td>
<td>0.000</td>
<td>-0.946*** (-7.387)</td>
<td>0.000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test Statistic</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-Squared</td>
<td>0.789</td>
<td>0.772</td>
<td>0.760</td>
<td>0.672</td>
</tr>
<tr>
<td>R-Bar Squared</td>
<td>0.695</td>
<td>0.670</td>
<td>0.708</td>
<td>0.587</td>
</tr>
<tr>
<td>S.E. of Regression</td>
<td>1.439</td>
<td>1.496</td>
<td>1.409</td>
<td>1.674</td>
</tr>
<tr>
<td>F. Statistic</td>
<td>11.226[0.000]</td>
<td>11.226[0.000]</td>
<td>16.9029[0.000]</td>
<td>9.067[0.000]</td>
</tr>
<tr>
<td>RSS</td>
<td>93.124</td>
<td>60.390</td>
<td>63.548</td>
<td>86.942</td>
</tr>
<tr>
<td>DW</td>
<td>2.109</td>
<td>2.234</td>
<td>1.742</td>
<td>2.120</td>
</tr>
<tr>
<td>AIC</td>
<td>-76.442</td>
<td>-77.997</td>
<td>-74.016</td>
<td>-81.285</td>
</tr>
<tr>
<td>SBC</td>
<td>-87.419</td>
<td>-88.974</td>
<td>-80.771</td>
<td>-88.885</td>
</tr>
</tbody>
</table>

Note: *, ** and *** denote statistical significance at 10%, 5% and 1% levels respectively. T-ratios are in parentheses ( ).
**Figure 2 - Plot of CUSUM and CUSUMQ**

### Model 1

**Plot of Cumulative Sum of Recursive Residuals**

![Plot of Cumulative Sum of Recursive Residuals](image1)

The straight lines represent critical bounds at 5% significance level.

**Plot of Cumulative Sum of Squares of Recursive Residuals**

![Plot of Cumulative Sum of Squares of Recursive Residuals](image2)

The straight lines represent critical bounds at 5% significance level.

### Model 2

**Plot of Cumulative Sum of Recursive Residuals**

![Plot of Cumulative Sum of Recursive Residuals](image3)

The straight lines represent critical bounds at 5% significance level.

**Plot of Cumulative Sum of Squares of Recursive Residuals**

![Plot of Cumulative Sum of Squares of Recursive Residuals](image4)

The straight lines represent critical bounds at 5% significance level.
The plots for the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squared residuals (CUSUMQ) indicate that there is stability in the parameters of all the four models used in the empirical analysis for South Africa. As displayed in Figure 2, the residual plots do not cross the boundaries.
5. **Concluding Remarks**

This paper examined the impact of trade openness on economic growth in South Africa, using the sample period 1975-2014. The main aim of this paper was twofold: firstly, to find out whether trade openness affects economic growth in South Africa; and secondly, to examine whether the impact of trade openness on economic growth depends on the proxy used. Specifically, the paper uses four indicators of trade openness. These include three trade-based indicators of trade openness, and an index of trade openness, reflecting the residual openness after taking country's size and geography into account. Previous studies that investigated trade openness and economic growth in South Africa and in Sub-Saharan Africa have found that there is a positive relationship between trade openness and economic growth.

In the current study, the empirical results show that, depending on the proxy used to measure trade openness, the impact of trade openness on economic growth varies between the short-run and the long-run. Based on the ratio of exports plus imports to GDP, the ratio of exports to GDP, and the ratio of imports to GDP, the results show that trade openness has a positive and significant impact on economic growth in South Africa. However, when the trade-openness index was used as a proxy for openness, the study failed to find any support for the positive relationship between trade openness and economic growth. This implies that when the effects of country size and geography are taken into account, then residual trade openness has no impact on economic growth. These results, therefore, suggest that country size and geography have a complementary effect on the extent to which trade openness affects economic growth in South Africa.

Based on the overall results of this study, it is evident that international trade plays a significant role in South Africa's economic growth. The implication is that, in order for South Africa to benefit more from international trade, it must continue with the policies that enhance increased trade openness in the country. In addition, since exports were found to have a positive impact on economic growth in the short-run, the export-promotion policies should be pursued further in South Africa, in order to reinforce the export-led growth in the country.
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