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THE DETERMINANTS OF IMPORT DEMAND IN SOUTH AFRICA: AN EMPIRICAL INVESTIGATION

ABSTRACT

This study uses the autoregressive distributed-lag (ARDL) estimation approach to investigate the key drivers of import demand in South Africa for the period 1985 to 2015. Unlike other previous studies, the study estimates four models: aggregate import demand, import demand for consumer goods, import demand for intermediate goods, and import demand for capital goods. The overall results show that aggregate import demand is positively determined by investment spending, consumer spending and relative import price, but negatively determined by government spending, both in the short run and in the long run. Other results show that: 1) foreign exchange reserves have a negative long-run impact on import demand; 2) trade liberalisation policy has a positive impact on aggregate import demand in the long run and a negative impact in the short run; and 3) exports of goods and services in the previous period have a positive short-run impact on import demand. In terms of consumer goods, import demand is positively determined by trade liberalisation policy in the long run, but only positively and negatively determined by foreign exchange reserves and trade liberalisation policy in the short run, respectively. In terms of intermediate goods, import demand is found to be positively determined by government spending, consumer spending and trade liberalisation policy, but negatively determined by relative import price, both in the short run and long run. In terms of capital goods, import demand is found to be negatively determined by foreign exchange reserves, both in the short and long run; while relative import price and exports of goods and services are found to have a long-run and short-run positive impact, respectively.

Keywords: ARDL Approach, Import demand, South Africa
JEL Classification: F1
RIASSUNTO

Le determinanti della domanda di importazioni in Sud Africa: un’analisi empirica

Questo studio analizza le determinanti della domanda di importazioni in Sud Africa nel periodo 1985-2015 tramite il modello ARDL autoregressivo a ritardi distribuiti. A differenza degli studi precedenti, questo articolo prende in considerazione 4 modelli: domanda aggregata di importazioni, domanda di importazione di beni di consumo, domanda di importazione di beni intermedi e domanda di importazione di capitali. Il risultato complessivo dimostra che la domanda aggregata è positivamente determinata dagli investimenti, dai consumi e dai prezzi di importazione relativi. Risulta invece negativamente determinata dalla spesa pubblica, sia nel lungo che nel breve periodo. Altre evidenze sono: 1) le riserve di cambio estere influenzano negativamente la domanda di importazioni sul lungo periodo; 2) le politiche di liberalizzazione del commercio influenzano positivamente la domanda aggregata nel lungo periodo e negativamente nel breve; 3) le esportazioni di beni e servizi nel periodo precedente hanno un impatto positivo sulla domanda di importazioni nel breve periodo. In termini di beni di consumo, la domanda di importazioni è positivamente determinata dalle politiche di liberalizzazione del commercio nel lungo periodo, mentre nel breve periodo le riserve di cambio estere hanno un’influenza positiva e le politiche di liberalizzazione del commercio influenzano negativamente la domanda di importazioni. Per quanto riguarda i beni intermedi, la domanda di importazioni è determinata positivamente dalla spesa pubblica, dai consumi e dalla liberalizzazione del commercio mentre i prezzi di importazione relativi la influenzano negativamente. Per quanto riguarda i capitali, la domanda di importazione è negativamente determinata dalle riserve di cambio esterne sia nel lungo che nel breve periodo, mentre il prezzo di importazione relativo e le esportazioni di beni e servizi hanno un impatto positivo sul lungo e sul breve periodo, rispettivamente.

1. INTRODUCTION

Emerging studies in the field of international economics are devoted to understanding the elasticity of import demand in developing countries (see Butts and Mitchell, 2012). This is because the behaviour of import demand has macroeconomic policy implications, since imports play an important role in economic development (Aljebrin and Ibrahim, 2012). Every country
strives to benefit from international trade in order to develop its economy. South Africa is no different, as the country is involved in international trade, predominantly on the importing side. Over the past years, South Africa has been persistently recording trade deficits and negative current account balances and has been highly dependent on imports. During the period from 2010 to 2016, imports as a percentage of GDP remained significant at an annual average of 30.1% (World Bank, 2016). Over the same period, the imports in this country have been growing faster than exports. While imports grew at an average rate of 3%, exports grew at an average rate of 1% (International Monetary Fund, 2015). Estimates from the World Bank (2015) show that in certain years, imports in South Africa had grown at a higher rate than the global imports growth rate. This is a disquieting trend, considering that the country has implemented trade liberalisation policies in an effort to mend its trade balance and balance of payments.

In light of this, the current study carries out a thorough examination of the determinants of aggregate and disaggregated import demand. The findings of this study would enable policymakers to predict deviations on balance of payments and terms of trade, and assist them when deciding on short-run and long-run development strategies and trade-related policies, including import demand management policy. Although there are a few studies that have attempted to examine the key determinants of import demand in South Africa, there are still gaps as the majority of them only focused on aggregate import demand.

The rest of the paper is organised as follows: section 2 presents the trends on South Africa’s imports, while section 3 provides theoretical and empirical literature on import demand. Section 4 presents the model specifications and the econometric methodology used in the study, while the empirical results are presented in section 5. Section 6 concludes the paper.

2. AN OVERVIEW OF SOUTH AFRICA’S IMPORTS

South Africa’s basket of imports has been expanding over the years. As a result, imports as a percentage of GDP remained significant at plus 20% over the period from 1995 to 2015. This could be attributed to policy reforms that the country adopted after the democratic elections in 1994. Figure 1 shows the trends of South Africa’s trade and trade balance with the rest of the world during the period 1995-2015.

During the period 1994-2003, South Africa recorded a positive trade balance (see Figure 1). However, the dominance of exports had started declining. This can be explained by the changes
in the rand exchange rate as it is one of the factors that contributed to the high level of exports in the country over the period 2001-2003 (see Black and Bhanisi, 2006). In 2004 imports started growing faster than exports and this led to a trade deficit. According to IDC (2013), this was as a result of a rapid increase in household consumption and public sector infrastructure investment during the period from 2003 to 2007. The trade deficit was also compounded by the rise in the cost of production, resulting from the economic recession in 2008. Figure 2 presents the trends in imports and imports growth rate over the period 1995-2015.

**Figure 1 - Trends of South Africa’s Trade and Trade Balance (1995-2015)**

![Trends of South Africa’s Trade and Trade Balance (1995-2015)](image)

*Source: Authors’ computation based on UNCTADstat database.*

**Figure 2 - South Africa’s Value of Total Imports and Imports Growth Rate (1995-2015)**

![South Africa’s Value of Total Imports and Imports Growth Rate (1995-2015)](image)

*Source: UNCTADstat database and Authors’ own computation based on UNCTADstat database.*

The rate at which imports have been increasing over the years has fluctuated between -20% and 35%. Notably, in 2009 the country experienced a drastic decline in imports. This was due to the
global recession and its effects on the economy during that period. Figure 3 depicts South Africa’s value of import products and services as a percentage of total trade.

**Figure 3- South Africa’s value of import products and services as a percentage of total trade (1995-2015)**

![Chart showing South Africa’s value of import products and services as a percentage of total trade (1995-2015)](chart)

The picture clearly shows that commodities account for a larger share (more than 80%) of the total of South Africa’s imports. Estimates from UNCTADstat (2015) show that the country’s merchandise imports have been growing faster than service imports over the years. Figure 4 presents annual trends in different import categories as a share of South Africa’s total merchandise imports from the world.

During the period from 1995 to 2015, South Africa’s merchandise imports appear to have been dominated by imports of capital goods accounting for an annual average of 33% of merchandise imports followed by imports of consumer goods accounting for 25%. During this period the imports of capital goods had been decreasing, while the imports of consumer goods were decreasing. Figure 5 depicts the structure and performance of South Africa’s service imports for the period 1995 to 2015.

As Figure 5 shows, transport services account for the largest portion of South Africa’s service imports, with transport services contributing 42%, and both travel services and other services accounting for 29% each, towards the total of South Africa’s service imports.
**Figure 4** - Different Imports Categories Imports as a Share of South Africa’s Total Merchandise Imports from the World (1995-2015)

*Source: Authors’ computation based on UNCTADstat database.*

**Figure 5** - Average Annual Share of Imports to Total Services Imports by Service Group (1995-2015)

*Source: Authors’ computation based on UNCTADstat database.*
3. LITERATURE REVIEW

3.1 Theoretical Literature

In literature, the major theories explaining the import demand function include the imperfect substitution theory, Keynesian theory, neo-classical theory, monetarist theory and the production theory. These theories emphasise the role of income, price and exchange rates in the determination of trade (Hong, 1999). The imperfect substitution theory, also known as the new trade theory, was developed in the early 1980s by Paul Krugman. According to this theory, the link between income and import demand goes beyond the purchasing power effect. It emphasises the assumption of differentiated goods, economies of scale and monopolistic competition (Bathalomew, 2010). The theory assumes that imports and exports are not perfect substitutes and explains the role of income in determining the volume of imports at a more disaggregated level (Shuaibu and Fatai, 2014).

The Keynesian approach, developed by Keynes (2010), emphasises the importance of goods and services for balance of payments. It comprises three theories: the Absorption theory, Elasticity theory and Keynesian Multiplier approach. The Absorption theory proposed by Alexander (1952) focuses on macroeconomic factors affecting a country’s current account. The Elasticity approach, also known as the J-Curve, puts more emphasis on the impact of real devaluation of exchange rates on balance of trade depending on the demand and supply of foreign exchange and foreign goods (Duasa, 2004). The Keynesian Multiplier approach is based on the macroeconomic multiplier analysis (Bathalomew, 2010). It explains the import demand as a function of income and price, while assuming that employment is variable and capital movements are adjustable (Englama et al., 2013).

The Neoclassical theory is associated with the Heckscher Ohlin (H-O) framework, which was developed based on the work of Ricardo (1817). It assumes that countries differ by factors of production, therefore they import goods for which they have least factor endowment (Englama et al., 2013).

The Monetarist theory emphasises the need to analyse the trade balance from the monetary demand and supply point of view. It perceives balance of payment as a monetarist phenomenon and argues that disequilibrium in the balance of payments can be eliminated through an adroit manipulation of monetary variables, especially domestic credit, under fixed exchange rate,
absence of sterilization by the monetary authorities, and stable demand for money function (Akpansung, 1998, cited in Akpansung (2013)).

3.2 Empirical Literature

A significant amount of empirical work has been carried out in an attempt to examine the determinants of import demand, in developed and developing countries. Pattichis (1999) estimated the price and income elasticities of disaggregated import demand for Cyprus, using annual time series data covering the period from 1975 to 1994. To estimate this, the study employed the bounds test, and the results suggested that relative import price and income are the major determinants of import demand.

Similarly, Egwakhide (1999) examined the determinants of import demand in Nigeria using the ordinary least squares and error correction method on a time series data covering the period from 1953 to 1989. The study modelled import demand as a function of income and relative import price, and the results showed that relative import price is the major determinant of import demand in Nigeria. Rijal et al. (2000) also examined the determinants of import demand in Nepal using Johansen’s co-integration method on a time series data covering the period from 1968 to 1997. The study specified import demand as a function of relative import price levels, domestic price levels and gross domestic product (GDP) as a measure of income. The findings revealed that income is the main determinant of import demand in Nepal, in the long run as well as the short run. Furthermore, it was found that Nepal’s import demand is less responsive to changes in relative import price and cross-prices. It is also worth noting that Nepal’s import demand responds mostly to general price changes than it responds to import price.

A similar study by Mah (2000) for Korea used the bounds test to examine the determinants of import demand for information technology products over the period from 1980 to 1997. The study specified import demand as a function of relative import price and income. The results showed that the impact of income is insignificant, while the relative import price is the most significant factor. Anaman and Buffong, (2001) also studied the determinants of aggregate import demand for Brunei Darussalam over the period from 1964 and 1997. The study modelled import demand as a function of real effective exchange rate, real GDP and population. Findings from the ordinary least squares suggested that all of the specified determinants have a
significant impact on import demand. However, population appeared to be the most influential determinants of import demand.

Tang (2002) re-assessed aggregate import demand behaviour for Indonesia using the bounds test and data for period from 1960 to 1999. To empirically estimate the Indonesian import demand function, the study adopted the traditional theory of import demand as a function of GDP and relative import price computed as a ratio of imports price index to domestic price index. This was done with the assumption that other variables can be incorporated in the two variables. The results confirmed stability in import demand function for Indonesia in the short run. In the long run, income has been found to have a positive and significant effect on import demand.

Masih and Masih (2000) used Johansen’s multivariate co-integration procedure and quarterly time series data for the period from 1974:1 to 1989:2 to re-assess long-run elasticities of Japanese’s import demand. The study expressed the import demand as a function of relative import price and real income. The results show that there is a long-run relationship between import demand and these variables. Furthermore, the study concluded that, in the long run, both relative import price and income have a significant impact on import demand and are major determinants of import demand.

Similarly, Chinn (2003) tested the existence of a relationship between import demand and its determinants for the United States of America over the period from 1975 to 2001. The study tested this using Johansen’s co-integration approach, and the results showed that exchange rates and real income have no significant impact on import demand. Using the bounds test approach, Bahmani-Oskooee and Kara (2003) estimated the import demand function for nine industrial countries, that is, Australia, Austria, Canada, France, Germany, Denmark, Italy, Japan and the USA. The study covered the period from 1973Q1 to 1998Q2. In the long run, income was found to have a significant influence on import demand.
4. METHODOLOGY

4.1 Model Specification

The analytical framework for import demand is underpinned by three theories, namely, the imperfect substitution theory, Neoclassical theory, and Keynesian theories. These theories together prescribe income and relative import price as major determining factors of import demand. Under the imperfect substitution theory, the assumption underlying the prescribed influence of income and prices on import demand is that imports and domestic products are not perfect substitutes (see Abrishami and Mehrara, 2002). This is in line with the argument in the conventional microeconomic theory, where a rational consumer is assumed to maximise utility subject to a budget constraint. The importance of relative import price for import demand is underscored in the Neoclassical theory (Bathalomew, 2010). Under this theory, there is no emphasis on the effects of income on imports, because the theory assumes a fixed level of employment, and full and efficient employment of resources (Cakmak et al., 2016). In contrast to the Neoclassical theory, the Keynesian theory assumes constant prices and variable income. It emphasises the importance of income for import demand (Bartholomew, 2010). The specification of the import demand model in these theories is in line with the traditional import demand model. According to Gafar (1988) and Tang (2002), the traditional model is given as follows:

\[ IMD_t = f(Y_t, RP_t) \]  

(1)

where IMD is the import demand, Y is the income for the importing country, and RP represents relative import price.

In the traditional model, all other variables are sub-modelled within the income and relative import price variables (Tang, 2003 and Hong, 1999, cited in Bathalomew, 2010). However, the modern literature presents a different approach, where additional explanatory variables are included (see Bathalomew, 2010; Narayan and Narayan, 2010; Dutta and Ahmend, 2004; Anaman, and Buffong, 2001; Butt and Mitchel, 2012; Modeste, 2011; Omove, 2012, among others). The additional variables in this study include investment spending, consumer spending, government spending, exports of goods and services and a dummy variable for trade liberalisation policy. Literature suggests that these variables have different patterns, and different import contents (see Chani and Chaudhary, 2012). Also, a model that also incorporates
different components of income has better forecasting powers than the standard import demand models (Narayan and Narayan, 2010).

The importance of relative import price (RP) in determining import demand is justified in empirical and theoretical literature (Sinha, 1997; Egwakhide, 1999; Rijal et al., 2000). In literature, this variable is measured through import price as a share of domestic price (see Rijal et al., 2000; Mah, 2000). However, because the data for this variable is not readily available, the study follows Anaman and Buffong (2001) and employs real effective exchange rate as a proxy for relative import price. The coefficient of this variable is expected to be negative. Investment spending (INV) is measured through gross fixed capital formation. This variable has been used in empirical studies such as Bathalomew (2010) and Modeste (2011) and has been found to have a significant and positive effect on import demand. Consumer spending (CE) and government spending (GE) are measured as total private spending and total public spending, respectively. These variables have been used in studies such as Omoke (2012); Budha (2014) among others and are expected to have a positive effect on import demand.

Foreign exchange reserves (FR) refer to foreign currency deposits held by a country’s central bank. Since it is the only medium of exchange in international market, it acts as a constraint for the developing countries to import necessary goods and services (Sultan, 2011). Therefore, this variable is expected to be positively related to import demand, as an increase in foreign reserves would stimulate import demand.

Exports of goods and services (EX) are measured through spending on exports of goods and services. Literature suggests that this variable is an important determinant of import demand (see Modeste, 2011; Budha, 2014 among others). EX is expected to have a positive effect on import demand.

Trade liberalisation policy is measured through a dummy, where 1 represents a period where there was an import policy change, while zero is used where there was no import policy change. The relationship between import demand and trade liberalisation policy change has been tested by many, and it has been found that the elimination of import policy distortion has a positive effect on import demand (see Hoque and Yusop, 2010). The coefficient of trade liberalisation policy is therefore expected to be positive.
In this study, both the aggregate and disaggregated import demand functions for South Africa are estimated. Modelling only the aggregated demand function for imports can be misleading, as different types of imports may behave differently (Abrishami and Mehrara, 2002; Tennakeen, 2010). The disaggregated import demand function in this study is classified into three groups, namely, import demand for consumer goods, import demand for intermediate goods, and import demand for capital goods. Following Bathalomew (2010), Narayan and Narayan (2010), Modeste (2011), Yahia (2015), Dutta and Ahmend (2004), Anaman and Buffong, (2001) and Butt and Mitchel (2012), the four models are specified as follows:

\[ Y = f(X_{X1} X_{X2} X_{X3} X_{X4} X_{X5} X_{X6}) \]  

(2)

where \( Y \) is the dependent variable for the four models, and \( X_{X1} \)–\( X_{X6} \) represent the explanatory variables. The explanatory variables employed include aggregate import demand (AIMD), import demand for consumer goods (IMDCON), import demand for intermediate goods (IMDINT), and import demand for capital goods (IMDCP), investment expenditure (INV), exports of goods and services (EX), relative import price (RP), consumer spending (CE), government spending (GE), foreign exchange reserves (FR) and a dummy variable for trade liberalisation policy (TL); \( \L \) is the natural log and \( \epsilon_t \) is the white noise error term.

4.2 The Autoregressive Distributed Lag Bounds Testing Approach

To empirically examine the relationship between import demand and its determinants, the study employs the autoregressive distributed lag (ARDL) bounds testing approach. This approach is based on the error correction version of autoregressive distributed lag (ARDL) model (Shareef and Tran, 2007). It is preferred over the other commonly used co-integration techniques such as the Engle and Granger (1987) two-staged method and the Johansen and Juselius (1990) method, for a number of reasons. Firstly, the ARDL model can be applied irrespective of the integration status of the underlying regressor, i.e. irrespective of whether the variable is integrated of order zero or one [I(0) or I(1)] (Pesaran et al., 2001). This allows statistical inference on long-run estimates that are not possible under other commonly used techniques (Harris and Sollis, 2003). Secondly, it is applicable on variables with different optimal lags and for small samples (Ozturk and Acaravci, 2011; Mah, 2000 cited in Tang, 2004). Thirdly, the model generally provides unbiased estimates of the long-run model and valid t-
The determinants of import demand in South Africa: an empirical investigation

The ARDL model employs only a single reduced form equation, while the conventional co-integration procedures estimate the long-run relationship within a context of system equations (Ozturk and Acaravci, 2011). The models to be estimated in this study can be expressed in the ARDL form as follows:

\[
\Delta Y_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta Y_{t-1} + \sum_{i=0}^{n} \beta_{2i} \Delta L X_{t-i} + \sum_{i=0}^{n} \beta_{3i} \Delta L X_{1,t-i} + \sum_{i=0}^{n} \beta_{4i} \Delta L X_{2,t-i} + \\
\sum_{i=0}^{n} \beta_{5i} \Delta L X_{3,t-i} + \sum_{i=0}^{n} \beta_{6i} \Delta L X_{4,t-i} + \sum_{i=0}^{n} \beta_{7i} \Delta L X_{5,t-i} + \sum_{i=0}^{n} \beta_{8i} \Delta L X_{6,t-i} + \\
\alpha_1 L Y_{t-1} + \alpha_2 L X_{t-1} + \alpha_3 L X_{1,t-1} + \alpha_4 L X_{2,t-1} + \alpha_5 L X_{3,t-1} + \alpha_6 L X_{4,t-1} + \\
\alpha_7 L X_{5,t-1} + \alpha_8 L X_{6,t-1} + u_t \tag{3}
\]

where \(\Delta\) is the first difference, \(L\) is the logarithm, \(I\) is the number of lags, \(u_t\) is the white noise error term, \(\beta_0\) is the constant, \(\alpha_1\) - \(\alpha_8\) are the coefficient of the long-run ARDL model and \(\beta_1 - \beta_8\) are the short-run dynamic coefficients.

The null hypothesis of no co-integration, expressed as:

\[H_0: \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = \alpha_7 = \alpha_8 = 0\]

is tested against the alternative hypothesis of co-integration, specified as:

\[H_1: \alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq \alpha_5 \neq \alpha_6 \neq \alpha_7 \neq \alpha_8 \neq 0\]

Under the null hypothesis, the asymptotic distribution of the F-statistic is non-standard. For all specified regressors, the co-integration test is provided by two critical bounds, namely, the upper bound and the lower bound (Evzen and Cerny et al., 2015). This is based on the assumption that all the regressors are on the one hand purely I(1) and, on the other, purely I(0), respectively (Pesaran et al., 2001). According to Pesaran et al. (2001), if the computed F-statistic falls outside the critical value bounds, a conclusive inference can be drawn if the underlying regressors are co-integrated of order I(0) or I(1). However, if the F-statistic falls inside these bounds, an inference is inconclusive and the order of the integration for the underlying variables needs to be known before a conclusive inference can be made. If a long-run relationship exists between the
variables under estimation, the second step is to run the regressions of the specified models to obtain the long-run and error-correction estimated. The ECM of models is specified as follows:

$$\Delta Y_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta Y_{t-1} + \sum_{i=0}^{n} \beta_{2i} \Delta X_{t-i} + \sum_{i=0}^{n} \beta_{3i} \Delta X_{1_{t-i}} + \sum_{i=0}^{n} \beta_{4i} \Delta X_{2_{t-i}} + \sum_{i=0}^{n} \beta_{5i} \Delta X_{3_{t-i}}$$

$$+ \sum_{i=0}^{n} \beta_{6i} \Delta X_{4_{t-i}} + \sum_{i=0}^{n} \beta_{7i} \Delta X_{5_{t-i}} + \sum_{i=0}^{n} \beta_{8i} \Delta X_{6_{t-i}} + ECM_{t-1} + u_t$$

where ECM is the error correction term and $u_t$ is the coefficient of the error correction term. After establishing the long-run and short-run coefficients, the study will proceed to diagnostic tests, which are used to examine the strength and weaknesses of estimated models.

4.3 Data Sources

The study employs annual time series data covering the period from 1985 to 2015. The data for aggregate import demand, consumer spending, government spending, investment spending, relative import price, foreign exchange reserves and exports of goods and services were sourced from United Nations Conference on Trade and Development (UNCTADstat) database, while the data on import demand for consumer goods, intermediate goods and capital goods was sourced from Quantecl and the World Bank.

5. Empirical results

5.1 Unit Root Test

The ARDL bounds testing method can be applied regardless of the integration status of the series under examination as long as none of the series is integrated of order 2 or higher. To ensure that this assumption is not violated, testing for unit root remains essential. The study employs three techniques the Dickey Fuller Generalised Square (DF-GLS), Phillips-Perron test and the Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test to test for stationarity. The unit root results are presented in Table 1.
### Table 1 - Unit Root Tests

<table>
<thead>
<tr>
<th>Variable</th>
<th>Dickey Fuller Generalised Square</th>
<th>Phillips-Perron</th>
<th>Kwiatkowski, Phillips, Schmidt, and Shin</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stationarity at levels</td>
<td>Stationarity after first differencing</td>
<td>Stationarity at levels</td>
</tr>
<tr>
<td></td>
<td>No Trend</td>
<td>Trend</td>
<td>No Trend</td>
</tr>
<tr>
<td>LFR</td>
<td>-1.306</td>
<td>-2.154</td>
<td>-7.438**</td>
</tr>
<tr>
<td>LINV</td>
<td>0.181</td>
<td>-1.515</td>
<td>-2.660**</td>
</tr>
<tr>
<td>LEX</td>
<td>-0.454</td>
<td>-2.576</td>
<td>-4.103**</td>
</tr>
<tr>
<td>LCE</td>
<td>1.269</td>
<td>-3.486</td>
<td>-3.481**</td>
</tr>
<tr>
<td>LGE</td>
<td>1.553</td>
<td>-1.113</td>
<td>-4.677**</td>
</tr>
<tr>
<td>LRP</td>
<td>-1.12</td>
<td>-2.737</td>
<td>-4.819**</td>
</tr>
<tr>
<td>LAIMD</td>
<td>0.053</td>
<td>-2.828</td>
<td>-3.714**</td>
</tr>
<tr>
<td>LIMDINT</td>
<td>0.178</td>
<td>-2.23</td>
<td>-3.783**</td>
</tr>
<tr>
<td>LIMDCON</td>
<td>0.191</td>
<td>-1.343</td>
<td>-4.847**</td>
</tr>
<tr>
<td>LIMDCP</td>
<td>-1.018</td>
<td>-2.509</td>
<td>-4.817**</td>
</tr>
</tbody>
</table>

*Note:* **indicate statistical significance at the 5% levels, respectively.
The DF_GLS results show that the tested variables are all not stationary in levels, and the null hypothesis cannot be rejected. After first differencing, the results show that all the tested variables are stationary at 5% level of significance. When the PP method is used, the results confirm that import demand for consumer goods and import demand for capital goods are stationary in level when no trend is included, while the rest of the variables are not stationary when no trend is included and when a trend is included. After first differencing, the results confirm that all the variables are stationary with and without a trend, and the null hypothesis is rejected. The results from the KPSS confirm that relative import price and import demand for intermediate goods are stationary in levels when a trend is included and when there is no trend, while aggregate import demand, import demand for consumer goods, consumer spending and government spending are stationary in levels only when a trend is included. The rest of the variables have been found to be stationary and integrated of order one [I(1)] after first differencing. The results from the three methods of unit root testing confirm that all the employed variables are stationary either in levels or after first differencing; and none of the employed variables are integrated of order 2 or higher. Having found this, the study proceeds to perform co-integration test using the ARDL bounds testing procedure.

5.2 The Autoregressive Distributed Lag (ARDL) Bounds Testing Approach to Co-Integration

The first step of the ARDL bounds test is to examine the evidence of co-integration between the import demand variable and the explanatory variables. This is tested by computing the F-statistics for each of the three countries and assess it against the respective critical values provided by Pesaran et al. (2001) in Table CI (iii) case III at 5% and 1% significance levels. The co-integration results for all the models (Models 1-4) are reported in Table 2.

The results from the bounds test confirm the existence of a long-run relationship between import demand and its determinants across all the four models. As shown in Table 2, the F-statistics for Models 1-4 are 6.533, 3.512, 7.703 and 4.054, respectively. The computed F-tests for all the four models are higher than the upper-bound asymptotic critical values. Therefore, the null hypothesis of no co-integration is rejected for all the models. Having found that the import demand variable and the explanatory variables used in this study are co-integrated, the study proceeds to estimate the long-run and short-run relationships between import demand and its possible determinants with the appropriate leg length, across the three models.
### Table 2 - ARDL Bound Test Results for Co-integration

<table>
<thead>
<tr>
<th>Country</th>
<th>Estimated Model</th>
<th>F-statistics</th>
<th>Inference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model1</td>
<td>AIMD = f(AIMD</td>
<td>FR INV EX CE GE RP TL)</td>
<td>6.533***</td>
</tr>
<tr>
<td>Model2</td>
<td>IMDCON= f(IMDCON</td>
<td>FR INV EX CE GE RP TL)</td>
<td>3.512***</td>
</tr>
<tr>
<td>Model3</td>
<td>IMDINT = f(IMDINT</td>
<td>FR INV EX CE GE RP TL)</td>
<td>7.703***</td>
</tr>
<tr>
<td>Model4</td>
<td>IMDCP   = f(IMDCP</td>
<td>FR INV EX CE GE RP TL)</td>
<td>4.054***</td>
</tr>
</tbody>
</table>

**Pesaran et al. (2001), p.300, Table CI(iii) Case III**

<table>
<thead>
<tr>
<th>Asymptotic Critical Values</th>
<th>1%</th>
<th>5%</th>
<th>10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>I(0)</td>
<td>2.96</td>
<td>2.32</td>
<td>2.03</td>
</tr>
<tr>
<td>I(1)</td>
<td>4.26</td>
<td>3.50</td>
<td>3.13</td>
</tr>
</tbody>
</table>

*Note:* ** and * indicate statistical significance at the 1% and 5% levels, respectively.

### 5.3 Estimation of Long-Run and Short-Run Coefficients

This sub-section presents long-run and short-run results on the import demand models for aggregate imports (Model 1), imports of consumer goods (Model 2), intermediate goods (Model 3) and capital goods (Model 4) in South Africa. The appropriate lag length is selected based on own lag selection for all the models. The method was preferred over the other methods because it provided more statistically meaningful results. The lag length for Models 1-4 are ARDL (2,1,2,1,0,0,0,2), ARDL (2,0,2,2,0,1,0,2), ARDL (1,0,0,0,0,1,0,1) and ARDL (2,0,2,0,1,1,0,2), respectively. The long-run and short-run results for these models are presented in Table 3.

The empirical results for Model 1 show that investment spending (LINV), consumer spending (LCE), exports of goods and services in the previous period (EXI), trade liberalisation policy (TL) and relative import price (LRP) are positive determinants of aggregate import demand, while foreign exchange reserves (LFR) and government spending (LGE) and trade liberalisation policy in the previous period (DTL1) are negative determinants. The long-run coefficients presented in Panel A of this column confirm that a 1% increase in LINV, LCE, TL and LRP result in a 0.75%, 1.36%, 0.28% and 0.31% increase in aggregate import demand, while a 1% increase in LFR and LGE leads to a 0.08 % and 0.73% decrease, respectively. The coefficients of these variables are statistically significant at either 1%, 5% or 10% level. The short-run results are presented in Panel B of the same column, and confirm that a 1% increase in DLEX1, DLINV, DLCE and DLRP results in a 0.21%, 0.71% 1.89%, and 0.35% increase in aggregate import demand.
demand, while a 1% increase in DTL, DLGE and DTL1 results in a 0.09%, 0.69% and 0.11% decrease, respectively. With the exception of LIMD, TL1, LRP, LGE and LFR, both the long-run and short-run coefficients have the expected signs and are consistent with theoretical expectations and other previous studies (see Agbola, 2009; Bathalomew, 2010 among others).

The findings for Model 2 are shown in the third column of Table 3, and show that foreign exchange reserves (DLFR), trade liberalisation policy (TL), trade liberalisation policy in the previous period (DTL1) are positive determinants of import demand for consumer goods. The long-run coefficients of these variables are presented in Panel A and Panel B of the same column, respectively. The results confirm that in the long run, a 1% increase in TL leads to a 1.33% increase in aggregate import demand. In the short run, it was found that a 1% increase in DLFR and DTL1 leads to a 0.15% increase and 0.66% decrease in import demand for consumer goods, respectively. The positive effect of these variables is consistent with theory and finds support in the work of Bathalomew (2010) and Khan et al. (2013), among others.

The long-run and short-run results for Model 3 are reported in the fourth column of Table 3. The findings show that trade liberalisation policy (TL), consumer spending (CE) and government expenditure (LGE) are positive determinants of aggregate import, while relative import price (LRP) is a negative determinant. The long-run results reveal that a 1% increase in TL, LCE and LGE leads to a 0.37%, 1.72% and 0.47% increase in import demand of intermediate goods, respectively, while a 1% increase in LRP leads to a 0.91% decrease. In the short run it was found that a 1% increase in TL, LCE and LGE leads to a 0.23%, 0.62% and 0.44% increase in import demand of intermediate goods, respectively, while a 1% increase in LRP leads to a 0.86% decrease. The coefficients of the three variables carry the correct sign and are consistent with theoretical expectations and the findings in Bathalomew (2010), among others.
### TABLE 3 - Estimation of Long-Run and Short-Run Results

#### Panel A: Estimated Long-Run Coefficients

<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>LCE</td>
<td>1.363(2.932)**</td>
<td>1.784(1.236)</td>
<td>1.718(3.595)***</td>
<td>-1.577(-1.025)</td>
</tr>
<tr>
<td>LEX</td>
<td>-0.423(-1.383)</td>
<td>-0.732(-0.546)</td>
<td>-0.256(-1.020)</td>
<td>1.535(1.612)</td>
</tr>
<tr>
<td>LFR</td>
<td>-0.079(-1.981)*</td>
<td>0.058(0.218)</td>
<td>0.040(1.042)</td>
<td>-0.283(-2.904)**</td>
</tr>
<tr>
<td>LGE</td>
<td>-0.727(-2.629)**</td>
<td>1.501(1.154)</td>
<td>0.468(1.956)*</td>
<td>1.296(1.204)</td>
</tr>
<tr>
<td>LINV</td>
<td>0.752(4.74)***</td>
<td>-0.502(-0.744)</td>
<td>-0.168(0.364)</td>
<td>0.406(0.752)</td>
</tr>
<tr>
<td>LRP</td>
<td>0.399(2.006)*</td>
<td>-0.635(-0.507)</td>
<td>-0.911(-3.990)***</td>
<td>1.120(0.614)*</td>
</tr>
<tr>
<td>TL</td>
<td>0.275(4.505)***</td>
<td>1.326(2.934)**</td>
<td>0.367(6.724)***</td>
<td>0.114(0.557)</td>
</tr>
<tr>
<td>INPT</td>
<td>-1.174(-0.751)</td>
<td>-17.508(-3.213)***</td>
<td>-11.172(-7.448)</td>
<td>-9.965(-1.863)</td>
</tr>
</tbody>
</table>

#### Panel B: Estimated Short-Run Coefficients

<table>
<thead>
<tr>
<th></th>
<th>dLIMD1</th>
<th>dLIMDCON1</th>
<th>dLIMDCP1</th>
</tr>
</thead>
<tbody>
<tr>
<td>dLIMD1</td>
<td>-0.067(-0.529)</td>
<td>-0.108(-0.679)</td>
<td>-0.161(-0.736)</td>
</tr>
<tr>
<td>dLIMDCON1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dLIMDCP1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dLCE</td>
<td>1.892(4.051)***</td>
<td>1.050(1.320)</td>
<td>1.622(3.601)***</td>
</tr>
<tr>
<td>dLEX</td>
<td>0.029(0.142)</td>
<td>-0.562(-0.985)</td>
<td>-0.241(-1.065)</td>
</tr>
<tr>
<td>dLFC</td>
<td>0.295(2.046)*</td>
<td>0.418(1.680)</td>
<td>0.398(1.631)</td>
</tr>
<tr>
<td>dLFR</td>
<td>0.023(-0.028)</td>
<td>0.151(1.777)*</td>
<td>0.037(1.071)</td>
</tr>
<tr>
<td>dLFR1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dLGE</td>
<td>-0.685(-2.254)**</td>
<td>0.883(1.466)</td>
<td>0.442(1.779)*</td>
</tr>
<tr>
<td>dLINV</td>
<td>0.708(4.272)***</td>
<td>0.036(0.097)</td>
<td>0.278(1.647)</td>
</tr>
<tr>
<td>dLRP</td>
<td>0.376(1.914)*</td>
<td>-0.374(-0.587)</td>
<td>-0.861(-3.171)***</td>
</tr>
<tr>
<td>dTL</td>
<td>-0.094(-1.911)*</td>
<td>0.114(0.888)</td>
<td>0.227(4.024)***</td>
</tr>
<tr>
<td>dTL1</td>
<td>-0.198(-3.621)***</td>
<td>-0.655(-5.883)***</td>
<td>-0.998(-1.305)</td>
</tr>
<tr>
<td>ecm(-1)</td>
<td>-0.942(-6.254)***</td>
<td>-0.588(-3.013)***</td>
<td>-0.944(-4.516)***</td>
</tr>
<tr>
<td>R-Squared</td>
<td>0.935</td>
<td>0.892</td>
<td>0.756</td>
</tr>
<tr>
<td>R-Bar-Squared</td>
<td>0.859</td>
<td>0.749</td>
<td>0.627</td>
</tr>
<tr>
<td>F-Stat.18.0099</td>
<td>16.886[0.000]</td>
<td>9.031[0.000]</td>
<td>7.354[0.000]</td>
</tr>
<tr>
<td>Serial Correlation</td>
<td>0.230[0.631]</td>
<td>2.359[0.125]</td>
<td>0.268[0.605]</td>
</tr>
<tr>
<td>Functional Form</td>
<td>2.2448[0.134]</td>
<td>4.206[0.040]</td>
<td>1.532[0.216]</td>
</tr>
<tr>
<td>Normality</td>
<td>0.51393[0.773]</td>
<td>0.444[0.801]</td>
<td>3.475[0.176]</td>
</tr>
<tr>
<td>Heteroscedasticity</td>
<td>2.491[0.114]</td>
<td>0.014[0.907]</td>
<td>0.052[0.820]</td>
</tr>
</tbody>
</table>

*Note:* ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.
For Model 4, the long-run and short-run results are presented in the fifth column of Table 3. It is found that exports of goods and services (LEX) and relative import price (LRP) are positive determinants of import demand for capital goods, while foreign exchange reserves (LFR) is a negative determinant. The long-run coefficients presented in Panel A of this column suggest that a 1% increase in LRP leads to a 1.12% increase in import demand for capital goods, while 1% increase in LFR leads to a 0.28% decrease. The short-run coefficients presented in Panel B of the same column confirm that a 1% increase in DLEX leads to a 1.45% increase in import demand of capital goods, while a 1% increase in DLFR leads to a 0.14% decrease in import demand for capital goods, respectively. The coefficients of the long-run and short-run determinants are statistically significant at either 1% or 5%. The long-run and short-run results for Model 4 are consistent with the findings by Budha (2014) and Sinha and Sinha (2000).

Overall, the results reveal that in Models 1 and 2, import demand is positively determined by investment spending both in the short-run and long-run. This variable appears to have no significant effect in Models 3 and 4. The results further confirm that trade liberalisation policy is only a long-run determinant of import demand in Models 1 and 3, a long-run and short-run determinant in Model 4 and only a short-run determinant in Model 2.

The coefficients of the error correction terms in Models 1-4 are negative and statistically significant at 1% level. This further confirms a co-integration between import demand and its determinants. The results from the diagnostic tests that are carried out confirmed that the estimated models have no problems of serial correlation, normality and heteroscedasticity. The cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMQ) results presented in Figures 6 (1-4) suggest that the estimated models are stable.
FIGURES 6- The Cumulative Sum (CUSUM) and Cumulative Sum of squares (CUSUMSQ) Tests
6. CONCLUSION

This study examined the determinants of import demand in South Africa from 1985 to 2015. Specifically, the study used the ECM-based ARDL bounds testing approach to examine the impact of foreign exchange reserves, consumer spending, government spending, exports of goods and services, investment spending, relative import price, and trade liberalisation policy on import demand. Unlike some previous studies that used a single model, the current study used four models, incorporating both aggregated and disaggregated import demand. The estimated models included aggregate import demand (Model 1), import demand for consumer goods (Model 2), import demand for intermediate goods (Model 3) and import demand for capital goods (Model 4).

The results for Model 1 show that aggregate import demand is positively determined by investment spending, consumer spending and relative import price, but negatively determined by government spending, both in the short and long run. Other results show that: 1) foreign exchange reserves have a negative long-run impact on import demand; 2) trade liberalisation policy has a positive impact on aggregate import demand in the long run and a negative impact in the short run; and 3) exports of goods and services in the previous period have a positive short-run impact on import demand. For Model 2, the results show that import demand for consumer goods is positively determined by trade liberalisation policy in the long run, while positively determined by foreign exchange reserves and negatively determined by trade liberalisation policy in the previous period, in the short run.

For Model 3, the results show that import demand of intermediate goods is positively determined by government spending, consumer spending and trade liberalisation policy, but negatively determined by relative import price. The results also show that exports of goods and services have a positive short-run impact on import demand, while foreign exchange reserves have a negative short-run impact. For Model 4, the results show that foreign exchange reserves have a negative impact on import demand for capital goods in both the short and long run. The findings also show that relative import price has a long-run and a short-run negative impact on import demand.

To summarise the results, the determinants of import demand in South Africa vary depending on the import category used as a dependent variable and the time span. Generally, the results
show that South Africa’s import demand, regardless of the category, is positively determined by at least one or more explanatory variables. It is, therefore, recommended that policymakers should ensure that the country’s imports are primarily intermediate or capital goods, in order to ensure that imports boost local productivity.

REFERENCES


