THE IMPACT OF APARTHEID AND INTERNATIONAL SANCTIONS ON SOUTH AFRICA'S IMPORT DEMAND FUNCTION: AN EMPIRICAL ANALYSIS

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ABSTRACT

In this paper we ascertain South Africa's aggregate import demand function over the period 1950 to 2008 utilizing the bounds testing approach to cointegration, and the unrestricted error-correction model. Our study empirically investigates the impact of apartheid (1950-1994), in particular the period of international sanctions (1981-1994) against the apartheid government, on South Africa's imports. Further, we utilize the autoregressive distributed lag model to estimate short-run and long-run import elasticities. Our results reveal that imports depend positively on the levels of domestic economic activity and foreign exchange reserves but negatively on relative prices. In addition, apartheid has had a significant short-run negative impact on import demand, but is insignificant in the long-run. Furthermore, international sanctions affected import demand positively in the short-run, but negatively in the long-run We argue that appropriate public policy is necessary to reduce the economy's reliance on imports of capital and intermediate goods, especially oil, while simultaneously diversifying its exports base. Strengthening trade relations with other developing countries will give it an exchange rate advantage, improve its balance of payments, create macroeconomic stability, growth, and with that, alleviate unemployment and poverty in South Africa.

JEL: F14, F31

KEYWORDS: South Africa, aggregate import demand, real exchange rates, elasticity

INTRODUCTION

Empirical investigation of the import demand function has been one of the most active research areas in international economics. Over the past three decades, numerous researchers have estimated aggregate import demand functions predominantly for developed countries essentially because of data constraints on developing economies. The traditional import demand function generally relates the aggregate quantity of imports to real income, the relative price of imports, and the lagged quantity of imports to capture any partial adjustment of desired to actual imports. However, this specification has several drawbacks, among them, the negligence of non-stationarity present in most macroeconomic variables, which causes serious statistical inference problems.

With the development of cointegration techniques for modeling nonstationary variables, the estimation of import demand functions has gained renewed attention. Since most studies have concentrated on the experience of industrialized countries, it is difficult to draw general conclusions from these findings to developing countries. This paper overcomes this problem by focusing on South Africa, a developing country. Our objective is to investigate South Africa's long-run import demand function and its associated short-run dynamics for the period 1950-2008. This import demand function is estimated using the bounds testing approach to cointegration and the error-correction model.

We proceed in the next section with a review of the literature and a brief history of South Africa. Thereafter we show the alternative forms of the estimated import demand function for South Africa. In the subsequent section a description of the variables and data used for estimation is presented. Empirical

results of cointegration tests and error-correction model estimates are presented and discussed in the section thereafter. The final section concludes the paper with policy recommendations.

LITERATURE REVIEW AND HISTORICAL BACKGROUND

Brief History of South Africa with Special Reference to Imports

South Africa is at the same time an African economic giant and a middle-income dualistic developing country (Truett & Truett, 2003). Until the financial crisis of 2008, it was deemed one of the fastest growing economies on the globe and was characterized as an emerging market ripe for foreign and domestic investment. Unfortunately, while South Africa boasts such dominance and growth, it also suffers serious economic problems associated with low exchange rate reserves, declining exports, increased imports, abnormally high unemployment rates, falling foreign reserves, and balance of payments constrictions (Saayman, 2010; Ngandu, 2008, 2009; Truett & Truett, 2003). However, while other developing countries suffered these problems because of their colonial heritage (Razafimahefa and Hamori, 2005, Gumede, 2000), South Africa suffered these problems primarily because of the rigidities imposed by the apartheid state (Thompson, 2000; Truett & Truett, 2003; Liu and Saal, 2001).

The apartheid era officially spanned the period 1948-1994, but was in effect for almost 100 years (Liu and Saal, 2001; Thompson, 2000). The apartheid economy thrived at first, but began to stagnate rapidly by the 1970's until its demise in the 1990's. This was due to the distorted allocation of resources, and the resultant inefficiencies created by racializing the economic structures of accumulation to serve the minority white race (Truett & Truett, 2003; Edwards, 2001). This stagnation was further reinforced by international sanctions, first in the form of an arms and oil embargo, and then through disinvestment from South Africa (Thompson, 2000). The apartheid government responded defensively to these sanctions by creating further rigidities through import substitution industries, high import tariffs, and subsidies for export promoting industries (Ngandu, 2009; Truett and Truett, 2003; Liu and Saal, 2001). During this late stage apartheid era, private investment contributed negatively to growth (-12.5%) and import substitution industries (ISI) accounted for 9.7% of GDP. GDP itself recorded average growth rates of only 1% in the 1980–90 period, and inflation manifested double-digits (World Bank, 2010). These macroeconomic indices were higher than the average by international standards, and it was clear that the apartheid regime operated in survival mode, constantly solving short-term problems rather than focusing on long-term policies. However, in hindsight, analysts paid scant attention to how these policies manifested themselves in the apartheid era's aggregate import demand function, which is the objective of this study.

The end of the apartheid era brought with it a change in South Africa's economic structure. The new post-apartheid government began to recreate a more open economy with the help of international governments who also eliminated international sanctions against South Africa (Department of Trade and Industry, 2010; World Bank, 2010; Truett & Truett, 2003; Edwards, 2001). To transform apartheid's survival mode of production to a dynamic mode, the new government implemented a series of strategic policies, among them: privatize parastatals, promote private investment, reduce tariffs and export subsidies, loosen exchange controls, cut taxes on corporate dividends, and enforce intellectual property rights, creating a more competitive international environment (Saayman, 2010; Kabundi, 2009; Edwards, 2001). As such, GDP increased steadily so that by 2007 real GDP growth reached 5%, inflation decreased to 3.9% (2005), private investment dramatically increased from negative rates to 15.1%, and exports increased exponentially from 11.5% in 1990 to 29.1% of GDP in 2001 (World Bank, 2010). South Africa also recorded its first ever budget surplus in history, helping it contain its external debt to 26% of GDP, which was lower than other similarly developing countries (Statistics South Africa, 2010).

South Africa's imports grew remarkably at a growth rate of 8.6% between 1995 and 2008. Table 1 displays the main sources of imports while Table 2 shows the composition of these imports. Asia is the

largest source of imports accounting for nearly 42.9% of imports in 2009, while Asia and Europe together account for more than 75% of imports. As the largest supplier of imports, China provides machinery and mechanical appliances, textiles and textile articles, base metals and articles of base metal, and products of the chemical or allied industries. Imports from Germany and the US consist mainly of machinery and mechanical appliances. Manufacturing goods account for the largest share of South Africa's imports and mining accounts for the second-largest share (Saayman, 2010). However, the share of manufacturing imports has decreased from 86.2% in 1992 to 74.9% in 2008 while the share of mining imports increased from 7.7% to 22.1% during the same period. (Department of Trade and Industry, 2010). It is a member of the World Trade Organization, is allowed to benefit from the US African Growth and Opportunity Act (AGOA), and most of its products can enter the United States market duty free (US Department of State, 2010; Kabundi, 2009). In fact, South Africa's fiscal structure, debt management, and trade policies, have been considered international best practices by international organizations (World Bank, 2010).

Table 1: Major Sources of South African Imports, 2009

Region/Country	Value of Imports (Millions of US$)	Share of Total Imports (%)
Asia	27,526.1	42.9
Europe	22,164.7	34.5
Americas	8,296.4	12.9
Africa	4,800.2	7.5
Pacific	1,259.2	2.0
China	8,418.0	13.1
Germany	7,520.0	11.7
United States	4,943.6	7.7
Saudi Arabia	3,168.3	4.9
Japan	3,129.2	4.9
Iran	2,628.4	4.1
United Kingdom	2,567.5	4.0
France	2,023.6	3.2
Nigeria	1,854.5	2.9
India	1,832.8	2.9

Note: This table shows the major sources of imports by continent and country, to South Africa. Data is taken from the Department of Trade and Industry, Republic of South Africa (2010).

Table 2: Major Imports to South Africa, 2009

HS	Product	Value of Imports (Millions of US$)	Share of Total Imports (%)
27	Mineral fuels, mineral oils and related products	13,694.48	21.3
84	Nuclear reactors, boilers, machinery and mechanical appliances	9,871.64	15.4
85	Electrical machinery and equipment and parts thereof	6,906.53	10.8
87	Passenger Vehicles	4,603.83	7.2
98	Special classification provisions	3,564.09	5.6
90	Optical photographic, cinematographic, measuring, checking,	1,842.85	2.9
30	Pharmaceutical products	1,602.52	2.5
39	Plastics and articles thereof	1,561.79	2.4
29	Organic chemicals	1,111.49	1.7
38	Miscellaneous chemical products	1,023.69	1.6
88	Aircraft, spacecraft and parts thereof	904.55	1.4
73	Articles of iron or steel	886.73	1.4
48	Paper and paperboard; articles of paper pulp	839.33	1.3
40	Rubber and articles thereof	824.77	1.3
28	Inorganic chemicals; organic or inorganic compound	791.55	1.2
10	Cereals	762.53	1.2
72	Iron and steel	740.03	1.2
64	Footwear, gaiters and the like; parts of such articles	571.90	0.9
15	Animal or vegetable fats and oils	553.20	0.9
62	Articles of apparel and clothing accessories, not knitted	514.80	0.8

Note: This table shows the major import products to South Africa. Data is taken from the Department of Trade and Industry, Republic of South Africa (2010).

Post-apartheid South Africa seems braced for sustained growth and economic upward mobility. Indigenous Africans comprising 78% of the population are projected to rise exponentially to the ranks of middle-class from just over 23% to 70% by 2026 (Statistics South Africa, 2010), leading to increases in the demand for all goods, including imports. However, although South Africa seems to be developing favorably, it faces grave challenges, among them, increased dependence on energy, intermediate and capital goods imports (see Table 2), an export economy that is dependent on natural resources, decreased foreign reserves, and exchange rate unpredictability (Saayman, 2010; Wabiri and Amusa, 2010; Kabundi, 2009; Truett & Truett, 2003; Edwards, 2001). Its currency, the *Rand*, has been more unstable than most of the world's currencies and this in turn has contributed to macroeconomic instability. The current account deficit and balance of payments shortcomings have become palpable (The Guardian, 2010). Politically, officials are beginning to debate the return of protectionist policies that were so prevalent in the apartheid era. However, to inform effective policy, one has to understand the aggregate import demand function for South Africa, which is the objective of our current study.

CURRENT STATE OF THE LITERATURE

Although considerable research has been undertaken on import demand functions, we only present the findings of studies that analyze the determinants of aggregate imports using refined econometrics techniques that test for non-stationarity. Our literature also focuses primarily on developing countries.

Akinlo (2008) employs a translog cost function to examine the substitution relations among capital, labor, and imports in Nigeria. Results indicate that domestic capital is a substitute for both labor and imports, although their elasticity values decrease over time, so that a current reduction in import prices is less significant on capital demand than before. Labor and imports have a complementary relationship so that lower import prices would positively affect the demand for domestic labor. Similarly, import prices affect the prices of domestic investment goods appreciably. These results suggest that, *ceteris paribus,* the relaxation of restrictions on foreign trade would lead to lower import prices and hence higher economic growth in Nigeria, leading to increased foreign reserves, and a better exchange rate.

Razafimahefa and Hamori (2005) analyze the long-run aggregate import demand functions of two very similar countries, Madagascar and Mauritius, for the period 1960-2000. Their results reveal that Madagascar's long-run income elasticity (0.855) is higher than for Mauritius (0.671), indicating a greater amount of income increases are used in imports in Madagascar than in Mauritius. The long-run relative price elasticities are almost equal for both countries (approximately -20), and demonstrate a huge sensitivity of relative prices to import demand. Further, stabilization and devaluation policies under structural adjustment policies (SAP) imposed in the 1980's have been effective in reducing import demand and therefore the external deficit. However in Madagascar, after the (SAP) era, imports remained low constricting economic growth, while in Mauritius imports increased again, and economic growth soared. The authors conclude that the most decisive objective of policy must not be to rely solely on reducing imports, but to encourage economic growth and exports simultaneously.

Narayan and Narayan (2005) approximate a disaggregated import demand model for Fiji using relative prices, consumption, investment, and exports using a small sample size for the period 1970 to 2000. They find that in the long- and short-run, consumption, investment, and exports have an inelastic and positive impact on import demand. However, while an increase in relative prices reduces imports, the relationship is inelastic (-0.6) reflecting a dependence on imports. Since Fiji is a price-taker, it has no control over import prices, leading the authors to favor monetary policies that affect relative prices, and export policies that enhance exports for balance of payments and exchange rate stability.

Dutta and Ahmed (2004) determine the long-run aggregate import demand function for Bangladesh from 1974 to 1994. Drawing on two different error correction models, the static cointegrating regression

equation and a vector autoregression method in which they include a dummy variable to portray the effects of import liberalization policies, they find a unique long-run relationship among quantities of imports, import prices, GDP, and foreign reserves. However, while both models convey statistically significant results, the second model reveals a slower rate of adjustment and hence a prolonged period of disequilibrium in the markets before attaining long-run equilibrium. Moreover, liberalization policy was not fully effective because the macroeconomic problems responsible for low import demand were ignored by policy-makers.

Tsionas and Christopoulos (2004) examine the import demand function of five industrial countries, namely, France, Italy, Netherlands, UK, and the US. They use maximum likelihood cointegration analysis, dynamic Ordinary Least Squares (OLS) and fully modified OLS to estimate the long-run import demand functions. They also investigate the short-run dynamics of import demand in these countries. Their results show significant long-run effects from relative prices and incomes, as well as significant short-run effects from temporary shocks. However, differences in their results emerge when they consider dynamic OLS versus fully modified estimation.

Matsubayashi and Hamori (2003), using quarterly data for different G7 countries in different periods under the flexible exchange rate system, analyze the stability of the aggregate import demand function for these countries. Results indicate no stable cointegrating relation between real import, real GDP, and relative import price for all G7 countries. Upon modifying their study to factor structural changes, results become significant for France and Germany, but not for the other countries, meaning that enhancing the domestic business environment will only influence the quantity of imports for certain countries.

Using annual data over the period 1973–1997, Tang (2002) establishes the long-run relationship of the Japanese aggregate import demand function. The author confirms that the long-run equilibrium relationship between imports and real income is positive and unit elastic (0.99), and between imports and relative prices is negative and inelastic (-0.82), implying that economic growth increases imports, and an increase in relative prices decreases the demand for imports less than proportionally. Both these conditions reduce Japan's trade balance, which given its trade balance surplus, is an objective of macroeconomic policies.

Gumede (2000), studies the import demand function for South Africa from 1972-1997. His results show long-run significant income elasticity (1.06) of import demand, but short-run elasticities are less significant. However, in terms of relative price elasticity, labor-intensive industries are more sensitive (-3.0) than capital-intensive industries (-0.71). These findings highlight the dependency of the South African economy on capital goods imports. He argues that because export demand has not grown significantly over the period, it has contributed to a foreign exchange problem, exacerbating the job creation dilemma faced by the economy.

Senhadji (1998) estimates a structural import demand function for 77 developed and developing countries and finds that the average price and income elasticities are higher in the long-run than in the short-run. Moreover, he argues that developed countries in general have higher income elasticities and lower relative price elasticities than developing countries, reinforcing results by Akinlo (2008), Agbola and Damoense (2005), Narayan and Narayan (2005), Razafimahefa and Hamori (2005), Dutta and Ahmed (2004), Gumede (2000), and Mwega (1993), among others.

MODEL SPECIFICATION

Since South Africa is a small developing open-economy, it a price-taker with respect to imports, and therefore permits our use of single-equation techniques for estimating the aggregate import demand function. We assume that only normal goods are imported, and that as a developing country, real foreign

exchange reserves comprises an important variable in the function. Further, we assume that apartheid and international sanctions have significantly affected import demand so they are included in the model.

The long-run aggregate import demand function for South Africa (in natural logs) is thus specified as

$$\ln M_t = \beta_0 + \beta_1 \ln Y_t + \beta_2 \ln RP_t + \beta_3 \ln FR_t + \beta_4 D_{1t} + \beta_5 D_{2t} + \varepsilon_t \qquad (1)$$

where M_t is the real import volume in period t; Y_t is the real GDP in period t; RP_t is the relative price of imports in period t; FR_t is the real foreign exchange reserves in period t; D_{1t} is a dummy variable representing the apartheid era (1950-1994) in South Africa; D_{2t} is a dummy variable representing the period of economic sanctions (1981-1994) against South Africa; and ε_t is the error term.

The first explanatory variable, Y_t in the specified model measures the real GDP of South Africa. Economic theory suggests that income in the importing country is a major determinant of a country's imports and has a positive impact. Thus, *a priori*, it is expected that $\beta_1 > 0$. The second explanatory variable, RP_t measures the relative price of imports, and is calculated as the ratio of import price to domestic price. Economic theory posits that an increase in the relative price of imports discourages imports so β_2 is expected to be negative. The third explanatory variable, FR_t measures the availability of foreign reserves, which can be used to represent the ability to import. Following Hoque and Yusop (2010), we have included the real foreign exchange reserve variable to capture the impact of export earnings on import demand, as export earning is one of the major sources of foreign reserves. This variable does not appear in the traditional import demand function. However, it is an important determinant of imports for developing countries. Since higher real foreign reserves tend to encourage imports, we would expect that $\beta_3 > 0$. The expected signs of β_1, β_2, and β_3 are borne out in empirical results by Hoque and Yusop (2010), Akinlo (2008), Agbola and Damoense (2005), Narayan and Narayan (2005), Razafimahefa and Hamori (2005), Dutta and Ahmed (2004), Tsionas and Christopoulos (2004), Tang (2004, 2002), Matsubayashi and Hamori (2003), Gumede (2000), Senhadji (1998), and Mwega (1993), among others.

The last two explanatory variables are dummy variables. D_1 represents the era of apartheid in South Africa and is defined to take the value 1 for years between 1950 and 1994 and 0 otherwise. D_2 represents the period of economic sanctions against South Africa, taking the value 1 for years between 1981 and 1994 and 0 otherwise. These two variables are expected to capture the impact of apartheid and economic sanctions on South Africa's imports. The signs of β_4 and β_5 can be either negative or positive.

Given recent advances in time-series analysis, in estimating the long-run model outlined by Equation (1), it is now common practice to distinguish short-run effects from long-run effects. For this purpose, equation (1) must be specified in an error-correction model (ECM) format following Pesaran, Shin, and Smith (2001), which has been used in many recent studies, including Hoque and Yusop (2010), Hye (2008), Narayan and Narayan (2005), Razafimahefa and Hamori (2005), and Tang (2002, 2003, and 2004). Using the bounds testing approach to cointegration analysis, we rewrite Equation (1) in an ECM format in Equation (2) below.

$$\begin{aligned}\Delta \ln M_t = {} & \alpha_0 + \sum_{i=1}^{n} \beta_i \Delta \ln M_{t-i} + \sum_{i=0}^{n} \gamma_i \Delta \ln Y_{t-i} + \sum_{i=0}^{n} \delta_i \Delta \ln RP_{t-i} + \sum_{i=0}^{n} \eta_i \Delta \ln FR_{t-i} + \\ & + \alpha_1 D_{1t} + \alpha_2 D_{2t} + \lambda_1 \ln M_{t-1} + \lambda_2 \ln Y_{t-1} + \lambda_3 \ln RP_{t-1} + \lambda_4 \ln FR_{t-1} + \omega_t \end{aligned} \qquad (2)$$

with all variables defined previously, except the first difference operator, which is Δ. Pesaran et al's (2001) bounds testing approach is based on two procedural steps. The first step involves using an F-test or Wald test to test for joint significance of the no cointegration hypothesis $H_0 : \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = 0$ against an alternative hypothesis of cointegration, $H_1 : \lambda_0 \neq 0,\ \lambda_1 \neq 0,\ \lambda_2 \neq 0,\ \lambda_3 \neq 0,\ \lambda_4 \neq 0$. This test is performed using Equation (2). The advantage of this approach is that there is no need to test for unit roots, as is commonly done in cointegration analysis. Pesaran, et al. (2001) provide two sets of critical values for a given significance level with and without a time trend. One assumes that the variables are I(0), and the other assumes that the variables are I(1). If the computed F-values exceed the upper critical bounds value, H_0 is rejected signaling cointegration among the independent variables. If the computed F-value is below the critical bounds values, we fail to reject H_0. Finally, if the computed F-statistic falls within the bounds, the result is inconclusive. After establishing cointegration, the second step involves estimating the short-run and long-run coefficients of the cointegrated model, the mathematical derivation of which can be found in Pesaran et al. (2001).

DATA SOURCES AND VARIABLES

Annual data for the period 1950-2008 are used in estimating our models. The data on nominal imports, the import price index, real GDP, foreign exchange reserves series, and domestic price index are taken from the International Monetary Fund's *International Financial Statistics Yearbook (2009)*. Nominal imports in *Rands* are deflated by the import price index (2005 = 100) to obtain the real import variable for South Africa. The real GDP variable is computed in millions of 2005 constant *Rand.* The relative price of imports series is constructed as the ratio of the import price index (2005=100) to domestic price index, as measured by the consumer price index (CPI) (2005=100). To obtain the real foreign reserves series, we deflated the nominal foreign exchange reserves series by the CPI.

EMPIRICAL RESULTS

Cointegration among Variables

Table 3 presents the bounds test results of cointegration for aggregate imports of South Africa. Comparing the computed *F*-statistics against its critical values, which are extracted from Pesaran et al. (2001), we can establish the bounds test for cointegration. Using equation (2), each variable in our specified equation (1) is defined as a dependent variable in the calculation of the *F*-statistic and the estimated *F*-statistics are reported in Table 3.

Table 3: *F*- test Results for Cointegration

Critical Value Bounds of the F-Statistic: Intercept and No Trend

	10 percent level		5 percent level		1 percent level	
k	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
3	2.72	3.77	3.23	4.35	4.29	5.61

Calculated F-statistic:

$F_M(M \mid Y, RP, FR)$	7.042***
$F_Y(Y \mid M, RP, FR)$	1.736
$F_{RP}(RP \mid M, Y, FR)$	3.139
$F_{FR}(FR \mid M, Y, RP)$	2.952

*Note: This table shows the results of the ARDL bounds testing for cointegration. The Critical values are taken from Pesaran, Shin, and Smith (2001, Table CI(iii) Case III, p. 300). k is the number of regressors. *** indicates the statistical significance at the 1 percent level.*

As seen in Table 3, when the dependent variable is taken to be import demand, the calculated *F*-statistic, 7.042, is higher than the upper bound critical value of 5.61 at the 1 per cent level of significance,. This result implies that the null hypothesis of no cointegration cannot be accepted for South Africa and a unique cointegration relationship between imports and its determinants is observable. However, when Y, RP, and FR are each taken as dependent variables, the calculated *F*-statistic, 4.29, is lower than the lower bound critical value at the 1 per cent level. Therefore, we fail to reject the null hypothesis in each case and there is no cointegration among the independent variables, which is expected.

Long-Run and Short-Run Elasticities

Having established a long-run cointegrated relationship between import demand and its determinants, the second step involves estimating the long- and short-run elasticities, which are presented in Tables 4 & 5. As can be seen in Table 4 all the long-run estimated elasticities exhibit the theoretically expected signs. Adjusted $\overline{R}^2$ is also very high, indicating that these variables strongly explain the long-run elasticities in the import demand function for South Africa. Income is statistically significant at the 1% level, and has an elastic effect on import demand. More specifically, a 1% increase in GDP or income will increase imports by 1.07%, which is equivalent to Gumede's (2000) elasticity value of 1.06. Foreign reserves is also statistically significant at the 1% level, but has a highly inelastic (0.1485) impact on import demand, lending credence to scholars' concerns that this factor contributes to volatility in the exchange rate. However, import demand, while inversely related to relative prices and highly inelastic (-0.0878), is not statistically significant. Because South Africa is highly dependent on the imports of intermediate and capital goods, this result makes sense, and reinforces the concern of its impact on the balance of payments deficit. This result however, contradicts most of the results by other studies, among them, Hoque and Yusop (2010), Akinlo (2008), Agbola and Damoense (2005), Narayan and Narayan (2005), Razafimahefa and Hamori (2005), Dutta and Ahmed (2004), Tsionas and Christopoulos (2004), Tang (2004, 2002), Matsubayashi and Hamori (2003), Gumede (2000), Senhadji (1998), and Mwega (1993).

Table 4: Long-run Elasticities for South Africa's Import Demand Function (1950-2008)

Dependent variable: $\ln M_t$		
Explanatory Variables	**Coefficient**	***t*-statistic**
Constant	-2.2081**	-2.737
$\ln Y_t$	1.0743***	18.479
$\ln RP_t$	-0.0878	-0.718
$\ln FR_t$	0.1485***	4.828
D_{1t}	-0.0221	-0.278
D_{2t}	-0.1302**	-2.413
Adjusted R-squared ($\overline{R}^2$)	0.9641	

*Note: This table shows the long-run elasticities of the estimated import demand function for South Africa.*** and ** indicate statistical significance at the 1% and 5% level, respectively.*

Table 4 also reveals that the coefficient for apartheid-era dummy variable, D_1, is negative but insignificant, meaning that the apartheid era has had an adverse but statistically insignificant impact on the import demand function in the long-run. These results indicate that ISI policies did not work so that import demand was relatively unaffected in the apartheid era. The coefficient for the economic sanctions period dummy variable, D_2, is negative and significant indicating that international sanctions negatively affect import demand in the long-run. To our knowledge, no other study has been able to establish this result.

The estimated short-run elasticities are presented in Table 5 showing that all the expected coefficient signs are met, and they are statistically significant at either the 1% or the 5% level. Upon comparing Table 5 with Table 4, it is clear that income is about three times more elastic in the short-run than in the long-run. Similarly, relative prices and foreign reserves are less inelastic in the short-run than in the long-run. Interestingly, while relative prices are insignificant in the long-run, they are significant in the short-run. These results show that change takes place much faster in the short-run than in the long-run.

Table 5: Error-Correction Representation for the Selected ARDL Model

Dependent variable: $\Delta \ln M_t$		
Explanatory Variables	Coefficient	*t*-statistic
Constant	-0.0053	-0.221
$\Delta \ln M_{t-2}$	-0.2332***	-2.989
$\Delta \ln Y_t$	2.8632***	6.510
$\Delta \ln RP_t$	-0.3210**	-2.061
$\Delta \ln FR_{t-1}$	0.0411**	2.183
D_{1t}	-0.0699***	-3.523
D_{2t}	0.0537**	2.117
ECM_{t-1}	-0.3636***	-4.496
Diagnostics		
R^2	0.711	
$\overline{R}^2$	0.669	
$\chi^2_{Auto}(2)$	1.893	p-value: 0.162
$\chi^2_{Norm}(2)$	0.236	p-value: 0.681
$\chi^2_{White}(2)$	1.129	p-value: 0.386
$\chi^2_{RESET}(2)$	2.408	P-value: 0.127

Note: This table shows the results of the short-run elasticities of the error-correction model.
**** and ** indicate statistical significance at the 1% and 5% level, respectively.*

In Table 5, unlike Table 4, the coefficient for D_1 is not only negative, but also significant at the 1% level, meaning that in the short-run, unlike the long-run, apartheid has had a significant impact on South Africa's import demand function. Therefore, in the short-run, the government adopting strong ISI policies worked effectively to reduce import demand. The relationship, although 3 times less inelastic than in the long-run, is still relatively very small at only (-0.0699). The coefficient for D_2 is positive and significant at the 5% level indicating that international sanctions positively affected import demand in the short-run, which is opposite from the long-run process, and contrary to expectations. The error correction term, ECM_{t-1}, gauges the rate at which import demand adapts to changes in the regressors before returning to its equilibrium level. More importantly, the error-correction term of the short-run model is statistically significant at the 1% level with the expected negative sign. The coefficient for ECM_{t-1} is 0.3636 and indicates that once the model in Equation (2) is shocked, convergence to equilibrium is relatively slow with only 36% of adjustment occurring in the first year.

Table 5 also reveals that none of the diagnostic tests are statistically significant, suggesting no evidence of autocorrelation in the disturbance of the error term. The model passes the Jarque-Bera normality tests indicating that the errors are normally distributed. The RESET test signifies that the model is correctly specified while the F-forecast tests indicate the predictive power/accuracy of the model. Finally, the

adjusted R^2 of 0.67 indicates that 67 per cent of the variation in import demand is explained by the variables in the model. Hence, based on these statistical properties, it is reasonable to say that the model is well behaved.

CONCLUSIONS, LIMITATIONS, AND SUGGESTIONS FOR FUTURE RESEARCH

In this paper, we have estimated an aggregate import demand function for South Africa during 1950-2008 using the bounds testing approach to cointegration. Our results suggest that a unique cointegration relationship between imports and its regressors, namely, relative prices, exchange reserves, and income, exists. This unique relationship enabled us to study the short-run and long-run elasticities of South Africa's import demand function. These results indicate that income and real foreign reserves are positive and significant in the short and long-runs and are consistent with other findings. However, clear differences exist in the relative prices coefficient between the short-run and the long-run: in the long-run, the coefficient (-0.0878) is highly inelastic and not statistically significant, which contradicts other studies; however, in the short-run, the coefficient is less inelastic and significant, supporting other studies. In all cases our results show that change takes place much faster in the short-run than in the long-run and support the theory that increasingly defensive apartheid strategies over time led to greater inflexibility in the market for imports to changes in relative prices and foreign reserves..

The study employed two dummy variables to capture the impact of apartheid and international sanctions on import demand. Our results contradict historical explanations: The coefficient for D_1 is negative and significant in the short-run, but insignificant in the long-run, meaning that apartheid has only had a short-run impact South Africa's import demand function. In the long-run, import substitution policies failed because of the economy's reliance on intermediate and capital goods imports. The coefficient for D_2 is positive and significant at the 5% level in the short-run, but opposite from the long-run when the coefficient is negative. Therefore, in the short-run, international sanctions positively influenced import demand, but in the long-run, it negatively affected South Africa's import demand function.

This study is the first of its kind to incorporate an analysis of apartheid and international sanctions on South Africa's import demand function and our results provide ideas for further research that could overcome the limitations of the present model. Since the economy has been characterized by exchange rate volatility, which has affected its trade structure, future studies could include this variable as a fourth regressor to capture its effect on import demand, allowing for results that are more robust. In addition, a third dummy variable could be added to the model to capture the period of international commitment to the post-apartheid economy, spanning the period 1995-2008. Comparing the effects of international commitments with that of international sanctions may better inform international agencies on the appropriate steps in fostering economic regime changes globally.

From a policy perspective, South Africa clearly must focus on monetary and fiscal policies that would reduce its imports of capital and intermediate goods, especially oil, while simultaneously focusing on diversifying its export base. Strengthening trade relations with other developing countries will also give it a foreign exchange rate advantage, thereby increasing its foreign reserves, and in turn, its balance of payments. To complement trade policies, domestic private investment must be targeted in labor-intensive industries. All these changes will ultimately contribute to a more stable exchange rate, greater macroeconomic stability, growth, and with that, an improvement of unemployment and poverty problems that characterize South Africa's economy.

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