DETERMINANTS OF IMPORTS DEMAND IN TANZANIA: A DYNAMIC SPECIFICATION

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Abstract

Imports play an important role to bridge the gap between domestic production and aggregate demand, to facilitate exports supply through imported inputs and overall economic growth. Imports are important in providing consumers with a greater variety of consumer goods and services. An analysis of BOT(various) reveals that total imports in real terms in Tanzania have generally been increasing in the 1967-2002 period with rapid increase after the liberalisation policies since the mid-1980s. Total imports have been dominated by capital goods which constituted about 60%, followed by imports of intermediate and of consumer goods which constituted 20% each. The objective of this article is to estimate a dynamic imports demand model of Tanzania in order to use the estimates for policy analysis. The regression results suggest that the only statistically significant variables that determine demand for imports (with coefficients in parentheses) are domestic price of imports (-0.198), gross domestic output (2.238), foreign reserves (-0.494) and foreign exchange earnings (0.544). All variables have the expected signs. The ECM is also statistically significant and has the expected negative sign suggesting that there is a long-run feedback mechanism to the demand for imports. The large coefficient for GDP suggests that domestic income is the most important variable determining demand for imports in Tanzania. As expected from theory, there is an inverse relationship between the domestic price of imports and demand for imports as well as between an increase in foreign reserves (which is "stored" in the central bank) and the demand for imports. Foreign exchange earnings or exports can readily be used to finance imports and hence are directly related to demand for imports.

1.0 Introduction

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After this brief introduction, the article proceeds with section two to discus trade and development which will be followed in section three with the presentation of the theory and empirical studies on demand for imports. Section four presents the empirical model and model results of the imports demand model while section five is the conclusion.

2.0 Trade and Development

The demand for imports and export supply are greatly influenced by trade policy which may encourage of discourage the country's participation in international trade. It is now widely accepted that trade policy is the fundamental determinant of economic performance (Helleiner 1992). Trade policy relates to the overall structure of incentives to produce and consume and, therefore, to export and import (Helleiner 1992). Such incentives include the use of market-friendly price incentives such as tariffs and subsidies and administrative instruments such as physical prohibition of imports and imports licensing.

The notion that trade is the engine of growth is an old one and can be traced back to at least Adam Smith (Edwards 1993). However, this idea was not popular during most of the 20th century when protectionist theories were dominant and the majority of the developing countries implemented import substitution industrialization (ISI) policies. The ISI policies were based on a limited degree of international openness. Import substitution industrialization was a predominant paradigm in the 1950s through the 1970s (Krueger 1984). In some developing countries, import substitution strategies continued even to the latter decades, under various names such as Basic Industrial Strategy. In Tanzania, for example, import substitution industrialization continued up to the mid 1980s when manufactured exports took-off. The index of import substitution in Tanzania rose persistently from 36.5, during 1966-70 to 519, during 1981-5 but fell precipitously to 30.9 during 1988-90, indicating a shift away from import substitution to export promotion policies (Ndulu and Semboja 1995).

The basis of the ISI policies was the premise that in the absence of industrialization in the developing countries, a secular decline in international prices of primary commodities would result in a widening gap between rich and poor countries. In order to close or reduce the development of the income gap between the rich and poor countries, the poor countries have to industrialize. Industrialization in the smaller and

poor countries required assistance in the form of protection against foreign manufacturers or competitors. This is the infant industry argument for industrialization (Krueger 1984).

Beginning in the 1980s, the protectionist paradigm and its influence on policy makers began to cave in. The idea that open and outward oriented economies performed better than those pursuing protectionism became increasingly entrenched both theoretically and empirically.

Several studies strongly critized the ISI protectionist policies. This criticism was pioneered by Little et al. (1970) and Balassa (1971). Many other authors, including Krueger (1978) and Choksi et al. (1991), joined the criticism of the ISI policies. Import substitution was especially criticized for stifling new and choking off the expansion of the existing export industries and thus negatively influencing exports and overall economic growth.

In their study on the development of manufacturing for exports in Tanzania, Ndulu and Semboja (1995) found a negative correlation between import substitution and export orientation in the country's manufacturing sector during 1966-90. They noted that the squeeze on imports during 1981-85 created shortages of the manufactured goods and thus raised their domestic price above what the manufacturers could get in export markets. This made some manufacturers reduce their sales to the export markets and increase the sales in the domestic market. The net effect on the trade balance of the reduction in import volume due to the import substitution policy and the consequent fall in export earnings depends on the relative change in the import demand and export supply. The trade balance deficit will fall only if the decline in import demand is greater than the fall in export supply.

The critique of import substitution policies was supported by empirical studies using the effective rate (Little et al. 1970, Balassa 1971), trade bias indicator in exports and overall gross national product growth (Krueger 1978) and an index of trade intervention in the endogenous growth model (Edwards 1992). In critizing protectionist trade policies, such studies advocated international trade and complementary macroeconomic policies for successful export-led industrialization and rapid economic growth.

In a study of nominal and effective rates of protection in selected developing countries, Balassa (1971) and Little et al. (1970) found that the degree of effective protection granted to manufacturing value added was significantly higher than suggested by straightforward data or nominal protection. The effective rate of protection was sometimes (close to or more than) two times the nominal protection. Higher effective rate of protection for manufacturing than for agriculture is an indication that the country in question is encouraging industrialization at the expense of agriculture which is the main export sector in most developing countries (Edwards 1993). High rates of effective protection imply that the country in question pursues inward looking trade policies and thus hampering exports and overall economic growth.

Another indicator of trade orientation widely used in trade and development literature is the trade bias indicators. The indicator has the advantage of providing a continuum of regimes over time. However, it does not provide a sharp definition of what, for example, trade liberalization is. Krueger (1978), for example, defines trade liberalization as any reduction in anti-export bias. This implies that it is possible for a country to liberalize her economy while at the same time imposing extremely high import tariffs as long as other import surcharges and quantitative restrictions are reduced relative to the sum of export subsidies and other export incentives. Other authors regard trade liberalization as synonymous with free trade in which all trade distortions are eliminated (Edwards 1993). Thus, in general, there is no consensus on a precise and operational measure of trade orientation.

Edwards (1992) attempted to fill in the gap in growth equations by using endogenous growth models. Endogenous growth models are largely influenced by Romer (1986) and Lucas (1988). Edwards (1992) analyzed the relationship between trade orientation, trade distortions and growth using an endogenous growth model that emphasizes the process of technological absorption in small developing countries. According to this model, countries that liberalize and become more open will tend to grow faster. The results of the model supported the contention that more open economies tended to grow faster than economies with trade distortions.

From the discussion above, we have seen that there are (sometimes) conflicting views on the role of trade policy in economic performance in general and the performance of merchandise trade in particular. The arguments for or against trade are often laden with ideological sentiments in excess of theoretical and empirical verification. (See Edwards 1993). It is thus important to review the general literature on trade and development to lay the basis for further empirical and theoretical analysis.

3.0 Determinants of Imports Demand: Theory and Empirical Evidence

On the imports side, the early specifications of the import demand function (which is the demand function for foreign exports) followed the textbook two-explanatory variable case of being negatively conditioned by domestic relative import price and positively related to domestic income via the Keynesian marginal propensity to import (Khan, 1974). The relative price being the price of imports relative to the prices of competing products at home, if it is home demand, or abroad, if it is foreign demand that is being specified.

Later research on import demand has taken cognizant of the likely impact of liquidity constraints due to restrictive domestic expenditure/absorption control policies as suggested by Goldstein and Khan (1985). Extensions of the model have also been made to integrate monetary aspects by including a domestic liquidity variable such as wealth or excess money balances (Kincaid, 1984). To recognize the special nature of balance of payments constraints facing developing countries, an external liquidity constraint variable has also been suggested as a determinant of import demand and has taken

various forms, such as foreign exchange constraint and capital flows. (See, for example, Ndulu, Semboja and Mbelle 1995, Mwega 1993, Jebuni et al. 1991, and Moran 1989), or the extent of quantitative trade restrictions such as quotas or exchange controls (Lopez and Thomas, 1990).

In a study of import demand in Kenya, Mwega (1993) utilized an error-correction model to estimate demand elasticities for aggregate and component imports. The study used annual data for the 1964-91 period. Mwega (1991) found that, in the long-run, aggregate imports were significantly influenced (with expected sign) by relative prices, real incomes, foreign assets and foreign exchange earnings. Relative prices had a stronger influence (with elasticity of 0.40) on aggregate import demand than had nonprice variables (whose elasticities averaged 0.32). Components imports, however, Mwega (1993) found that relative prices and real income aggregate import demand elasticities were non-significant. The estimated short-run elasticities were non-significant. However, aggregate imports were strongly responsive to lagged foreign assets reserves and foreign exchange earnings.. The non-significant relative price and real income elasticities for the short-run aggregate imports in Kenya suggests that devaluation and stabilization policies pursued in the past did not effectively assist trade liberalization efforts. More generally, they suggest that outward oriented policies which aim at increasing export earnings and access to external capital inflows have a larger impact on import demand than those concentrating exclusively on the management of aggregate demand and the exchange rate.

Evidence from import demand studies in Kenya indicate that elasticities for aggregate and disaggregate import demand may not necessarily be of the same size and the signs of the elasticities may even differ. (See Mwega 1993). The differences in the size and sign of the elasticities make it more appropriate to estimate both aggregate import demand and its component parts.

In Jebuni et al. (1991) study on the real exchange rate policy and macroeconomic performance in Ghana, it was found that the real exchange rate was a significant determinant of all categories of imports. Capital inflows and real income, however, were statistically significant only for some categories of imports. We suspect that their method of analysis was behind some of the perverse results, namely, that real income and foreign reserves may be insignificant only for some categories of imports. We suspect that their method of analysis was behind some of the perverse results, namely that real income and foreign reserves may be insignificant determinants of import demand. The authors ran the regressions with variables in log levels without testing for stationarity or cointegration. If the variables are nonstationary and not cointegrated, the appropriate procedure would have been to run the models with the variables in first difference.

Silumbu (1995) estimated import demand function for both aggregate and disaggrete import demand in Malawi. He used cointegration and error-correction models with

annual data for 1967-94 period. On cointegration results, Silumbu (1995) found that demand for imports was cointegrated only with the real exchange rate, real income and credit availability. In the long-run the author found that price variables (or the real exchange rate) had a stronger impact (with elasticity of -0.40) on import demand than had non-price (or income and credit availability), whose elasticities averaged 0.24. In the short-run, however, the nonprice variables had a stronger influence than the real exchange rate. Hence, import and trade balance management policies (such as nominal devaluation and monetary discipline to reduce money supply and domestic inflation) are more important in the short-run while policies aimed at increasing export earnings (or foreign exchange receipts) and capital inflows (or foreign assets) are more important in the long-run.

The study by Khan and Knight (1988) for 34 developing countries found that nonprice variables had a stronger influence on import demand than had relative import prices. While the price elasticities were less than 0.20, those for income lagged, imports and real official reserves ranged between 0.33 and 0.61. These findings suggest that policy makers in developing countries should put more emphasis on non-price variables than relative prices for the management of the trade balance.

In a study of the determinants of imports demand in Nigeria, Egwaikhide (1999) used an error correction model to estimate demand for overall and diaggregated imports between 1953 and 1989. His findings were that short-run import decisions were determined by the dynamics of foreign exchange, which was tied to the long-run effect through the feedback mechanism. From the empirical results, the author concluded that if the Nigerian government wished to increase imports, it was essential to implement policies that would enhance foreign exchange availability.

4.0 Modelling Imports Demand

Following Moran (1989) and Egwaikhide (1999), we formulate the long-run cointegration general import demand model as follows:

$$\ln MA_t = \alpha_0 + \alpha_1 \ln PDM_t + \alpha_2 \ln GDP_t + \alpha_3 \ln R_t + \alpha_4 \ln F_t + \varepsilon_t \qquad (1)$$

where MA is imports expressed in 1992 prices and adjusted for import misinvoicing, GDP is real gross domestic product at factor cost, R is foreign reserves, F foreign exchange earnings, α_i (for i=0,1,..,4) are parameters to be estimated, ε is an error term, t is time subscript and ln is natural logarithm operator. It should be emphasised that in a long-run cointegration equation, there are no dynamics or lagged variables. Once cointegration is confirmed for the levels regression there is no reason to worry about spurious regression since the OLS estimates are not only consistent, but are "super consistent" (Murkherjee et al. 1998). In that case, it will be proper to proceed with an error correction specification.

4.1 Empirical Results for the Long-run Cointegration Model

Empirical results for the cointegration equation, equation 1, are presented in Table 1. The regressors explain 87% of changes in the demand for imports and it passes all diagnostic tests for first order autocorrelation (DW=1.6), heteroscedasticity, and model mis-specification.

Table 1: Modelling LMA_t by OLS: Estimation Sample is 1968 to 2002

	Coefficient	Std. Error	t-value	t-probability
Constant	1.432	5.712	0.251	0.804
$LPDM_t$	-0.131	0.071	-1.860	0.073
$LGDP_t$	0.612	0.380	1.610	0.117
LR_t	-0.797	0.085	-9.390	0.000
LF_t	0.876	0.092	9.490	0.000

Sigma = 0.220456 RSS = 1.458; RSS = 1.458; DW = 1.6
R^2 = 0.8737; F(4,30) = 51.90

Diagnostic Tests
ARCH 1-1 test: F(1,28) = 0.01169
Heteroscedasticity test: F(8,21) = 0.84325
RESET test: F(1,29) = 0.17192

Cointegration (Residual Stationarity) Test*

D-Lag	t-adf	Critical Values 5 %	10 %
0	-4.545	-3.90	-3.55
1	-3.834	-3.90	-3.55

Notes: * Critical values for the test were taken from Blangiewicz and Charemza (1990).

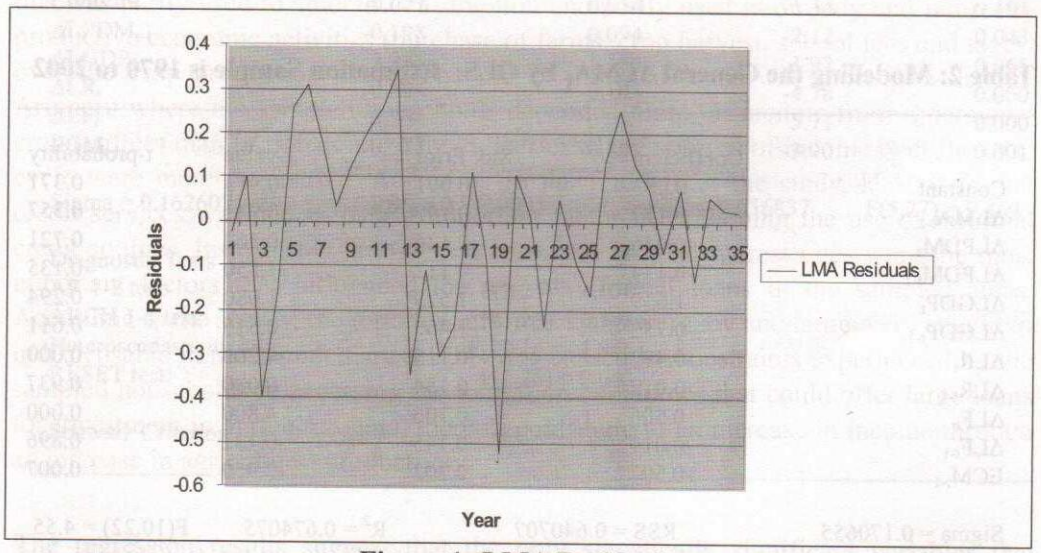

Figure 1: LMA Residuals

The t-adf stationarity test for the model residuals indicate that the residuals are stationary as the estimated t-adf statistics are greater than their respective critical values (at least for the contemporaneous residuals and at 10% confidence interval). The t-adf stationarity test was augmented by a plot of the residuals in Figure 2. Since the plot of the residuals cross the zero level several times, we can safely conclude that the residuals are indeed stationary. Stationarity of the residual means that the model log-level variables are cointegrated and this allows us to specify and estimate an error-correction model.

4.2 Modelling the Error-Correction ΔLMA_t Model

From equation 1 and given that cointegration has been confirmed in that equation, we can formulate an error-correction model as follows:

$$\Delta \ln MA_t = \beta_0 + \beta_1 \Delta \ln MA_{t-1} + \beta_2 \Delta \ln PDM_t + \beta_3 \Delta \ln PDM_{t-1} + \beta_4 \Delta \ln GDP_t + \beta_5 \Delta \ln GDP_{t-1} + \beta_6 \Delta \ln R_t + \beta_7 \Delta \ln R_{t-1} + \beta_8 \Delta \ln F_t + \beta_9 \Delta \ln F_{t-1} + \beta_{10} ECM_{t-1} + v_t \quad (2)$$

where Δ is the first difference operator, β_i (for i=0,1,...,10) are parameters to be estimated, ECM is the error-correction mechanism, v is the error term and the other variables are as defined above.

The empirical results for the general over-parameterised ΔLMA_t model are presented in Table 2. The model has a good explanatory power of 67% and passes all diagnostic tests for heteroscedasticity and model mis-specification. The Schwarz Criterion is (SC) 0.062.

Table 2: Modelling the General ΔLMA_t by OLS: Estimation Sample is 1970 to 2002

	Coefficient	Std. Error	t-value	t-probability
Constant	-0.083	0.091	-0.913	0.371
ΔLMA_{t-1}	0.179	0.190	0.941	0.357
$\Delta LPDM_t$	-0.046	0.126	-0.362	0.721
$\Delta LPDM_{t-1}$	-0.174	0.112	-1.550	0.135
$\Delta LGDP_t$	1.639	1.523	1.080	0.294
$\Delta LGDP_{t-1}$	0.752	1.460	0.515	0.611
ΔLR_t	-0.482	0.115	-4.200	0.000
ΔLR_{t-1}	0.012	0.154	0.080	0.937
ΔLF_t	0.506	0.106	4.800	0.000
ΔLF_{t-1}	-0.019	0.145	-0.132	0.896
ECM_{t-1}	-0.597	0.202	-2.950	0.007
Sigma = 0.170655	RSS = 0.640707		R^2 = 0.674075	F(10,22) = 4.55

Diagnostic Tests	
AR 1-2 test:	F(2,20) = 6.0283
ARCH 1-1 test:	F(1,20) = 0.0028
Heteroscedasticity test:	F(20,1) = 0.0856
RESET test:	F(1,21) = 0.0263
Schwarz Criterion	SC = 0.061688

In order to achieve model parsimony, we have to drop from the general model those variables that are not statistically significant while at the same time observing the SC. If the SC declines as we contiuously drop insignificant variables, it is evidence that we achiving model parsimony.

The empirical results for the parsimonious ΔLMA_t model are presented in Table 3. The Schwarz Criterion has dropped from 0.062 in the general model to -0.36 in the parsimonious model. The parsimonious model passes all the relevant diagnostic tests. The R2 has increased from 67 % in the general model to 71 % in the parsimonious model.

Table 3: Modelling the Parsimonious ΔLMA_t by OLS: Estimation Sample is 1970 to 2002

	Coefficient	Std. Error	t-value	t-probability
Constant	-0.073	0.054	-1.34	0.191
$\Delta LPDM_{t-1}$	-0.198	0.094	-2.12	0.043
$\Delta LGDP_t$	2.238	1.164	1.92	0.065
ΔLR_t	-0.494	0.103	-4.78	0.000
ΔLF_t	0.544	0.095	5.71	0.000
ECM_{t-1}	-0.575	0.148	-3.90	0.001
Sigma = 0.162607	RSS = 0.7139095		R^2 = 0.636837	F(5,27) = 9.469
Diagnostic Tests				
AR 1-2 test:	F(2,25) = 4.6786			
ARCH 1-1 test:	F(1,25) = 0.5785			
Heteroscedasticity test:	F(10,16) = 1.8431			
RESET test:	F(1,26) = 0.0457			
Schwarz Criterion	SC = - 0.3599			

The regression results suggest that the only statistically significant variables that determine demand for imports (with coefficients in parentheses) are domestic price of imports (-0.198), gross domestic output (2.238), foreign reserves (-0.494) and foreign

exchange earnings (0.544). All variables have the expected signs. The ECM is also statistically significant and has the expected negative sign suggesting that there is a long-run feedback mechanism to the demand for imports.

The large coefficient for GDP suggests that domestic income is the most important variable determining demand for imports in Tanzania. As expected from theory, there is an inverse relationship between the domestic price of imports and demand for imports as well as between an increase in foreign reserves (which is "stored" in the central bank) and the demand for imports. Foreign exchange earnings or exports can readily be used to finance imports and hence are directly related to demand for imports.

5. Conclusion

Given the importance of imports in bridging the gap between domestic production and aggregate demand, to facilitate exports supply through imported inputs and overall economic growth and to provide consumers with a greater variety of consumer goods and services, it is important for the government to enhance policies that would encourage imports. However, caution must be taken not to plunge the economy into excessive balance of payments deficits as these may be counter-productive. Since the most important variable in determining demand for imports is the domestic income, the government should adopt and implement those policies that enhance growth of the economy.

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