EXAMINING THE DETERMINANTS OF IMPORT DEMAND IN TANZANIA: AN ARDL APPROACH

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EXAMINING THE DETERMINANTS OF IMPORT DEMAND IN TANZANIA: AN ARDL APPROACH

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Abstract

The study investigates the determinants of aggregate and disaggregated import demand for Tanzania, over the period 1985 to 2015. The study employed the autoregressive distributed lag (ARDL) bounds testing approach. The empirical results confirm that aggregate import demand is positively determined by investment spending and export of goods and services, both in the long run and short run, but negatively determined by trade liberalisation policy only in the short run. The long-run results confirm that import demand for consumer goods is positively determined by gross national income, but negatively determined by trade liberalisation policy. The import demand for intermediate goods is found to be positively determined by exports of goods and services and gross national income, but negatively determined by trade liberalisation policy. The results further show that exports of goods and services and relative import price are positive determinants of import demand for capital goods. In the short run, the results confirm that import demand for consumer goods is positively determined by export of goods and services, gross national income and import demand for consumer goods in the previous period, but negatively determined by gross national income in the previous period and trade liberalisation policy. The results further confirm that the import demand for intermediate goods is positively determined by exports of goods and services, but negatively determined by gross national income. Lastly, import demand for capital goods is found to be positively determined by import demand for capital goods in the previous period, exports of goods and services, and relative import price.

Key words: ARDL Approach, Import Demand, Aggregate Import Demand, Disaggregated Import Demand, Tanzania

JEL Codes:

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1. Introduction

Theoretical and empirical literature confirms a strong link between foreign trade and economic growth in both developing and developed countries. The growing importance of foreign trade in economic growth is stimulated by the increased interdependence between countries (see Mishra, 2012; Huang and Chang et al., 2014). Foreign trade facilitates integration with the sources of innovation and enhances gains from foreign direct investment by increasing the size of the market. Also, trade openness allows economies to better capture the potential benefits of the increasing returns to scale and economies of specialisation (see Alesina et al., 2000; Bond et al., 2005, cited in Zahonogo, 2016).

Tanzania is one of the developing economies that benefit significantly from foreign trade. Over the period 1985 to 2016, the country’s total trade as a share of economic growth has increased rapidly from 13% to 42%, respectively. This is driven by the participation in different trade agreements at country level, regional level and globally, and the gradual implementation of different reforms and trade liberalisation policies (Msaraka and Hongzhong, 2015). According to Koniger and Busse (2015), trade policies promote improved resource allocation, allow accomplishment of economies of scale and encourage competition both in domestic and international markets. Tanzania’s participation in foreign trade has been predominantly on the import side, resulting in a constant recording of trade deficits. Over the period from 1985 to 2016 the country experienced a general increase in imports as a share of economic growth from 9% to 23%, respectively (see UNCTAD, 2016).

Literature provides no consensus on the importance of imports for economic growth, as some argue that imports are detrimental to economic growth and the country’s balance of payments, while others argue that, depending on the nature of the imported goods, imports may have positive effects on economic growth (Bakari and Mabrouki, 2017). According to Bakari and Mabrouki (2017), imports are considered to be a source of economic growth, if they include
hardware and electronic equipment to help and contribute to the increase and improvement of the investment. Estimates from World Bank (2016) show that in the case of Tanzania, imports are dominated by manufactured goods and fuels, accounting for an average of 68% and 15.3%, respectively. This raises questions on the key drivers of the country’s import demand, as it is dominated by manufactured goods, which may have a negative or no influence on economic growth. The objective of this paper is to examine the aggregate and disaggregated import demand for Tanzania. The paper is organised as follows: section 2 presents literature on import demand. Section 3 presents the model specifications and the econometric methodology employed in the study. Section 4 and 5 present empirical results and conclusion of the paper, respectively.

2. Literature review

Numerous empirical studies on determinants of import demand have been carried out for both developing and developed countries. This includes studies such as that by Narayan and Smyth (2005), who examined the determinants of aggregate import demand in Brunei Darussalam, for the period from 1964 to 1997 using the autoregressive distributed lag model (ARDL). The study employed gross domestic product, real effective exchange rate, petroleum price and population as explanatory variables. The results confirmed that real effective exchange rate and population are key determinants of import demand, while gross domestic product and petroleum price have no significant effect both in the long run and short run.

Adam et al (2011) emphasised the importance of inequality for import demand. To validate this they assessed the impact of income inequality on aggregate import demand for a sample of 59 selected developed and developing countries. For empirical analysis the authors used OLS on panel data covering the period from 1970 to 1997. The results revealed a highly significant impact of inequality on import demand. Also, a positive impact for high income countries and a negative link for low income countries were found. The study asserts that the
nature of the impact of income inequality is also determined by a country’s level of development.

Arize and Malindretos (2012) studied the link between foreign exchange reserve and import demand in five Asian countries. To estimate this, the study applied OLS on quarterly data covering the period from 1973 to 2005. The study expressed import demand as a function of foreign exchange reserves, relative prices and income. The findings suggested that foreign exchange reserve, income and relative prices do matter for import demand in both the short run and long run. Also, the findings showed that the impact of foreign exchange reserves is small when compared to income and relative prices.

In 2012, Hameed and Arshad used the bounds test to estimate the import demand function for palm oil in five leading countries, that is, India, China, Bangladesh, Pakistan and the United States of America. The study covered the period from 1979 to 2010 for Bangladesh, 1978 to 2010 for Pakistan and 1977 to 2010 for the rest of the countries. The import demand for these countries was specified as a function of income, palm oil price, and the price of a substitute oil. The results from the study showed that the palm oil and its substitute prices are major determinants of palm oil demand across all the countries, except for India. On the other hand, the GDP has been found to play an important role in shaping the palm oil demand in India. Health concern-induced government rules, trade liberalization policies and exchange rates were also found to be important factors affecting import demand for palm oil in some of these countries.

Budha (2014) examined the role of expenditure components on Nepal’s imports from India. The study also used the bounds test on annual data for the period from 1975 to 2011. The estimated model included private expenditure, public expenditure, and investment expenditure, spending on exports, and relative import price and trade liberalisation as potential determinants of import demand. The findings showed that private consumption is a major determinant of
Nepal’s import demand from India, while government spending was found to have no significant impact. Unexpectedly, the investment and exports expenditure was found to have a negative effect on Nepal’s imports from India while the relative prices and trade liberalisation appear to be positively related to import demand. According to Budha (2014), the unexpected positive relationship between the relative prices and imports signifies lack of substitutes for Nepal’s imports from India. Furthermore, the author argues that Nepal can reduce its trade deficit with India by stimulating expenditure for investment purposes and enhancing the country’s export base in order to reduce imports. This can be achieved by adopting the expenditure-switching policy from private spending and also adopting the monetary and fiscal policies (Budha, 2014).

Yahia (2015) evaluated Libya’s import demand function for the period from 1975 to 2008 using the ordinary listed squares method. The estimated model expressed import demand as a function of economic performance through gross domestic product (GDP), relative import prices, investment spending, managerial spending and population size and fluctuations in oil prices. Findings showed that the main determinants of Libyan imports include the GDP, oil price fluctuations and partial adjustment of imports. Furthermore, the author emphasised the need to consider the structure break problems and long-term relationship in estimating the import function.

Nteegah and Mansi (2016) studied the determinants of import demand in Nigeria for the period from 1980 to 2014. The study used the ordinary least squares and error correction mechanism to estimate the effect of income, exchange rate, external debt, investment spending, price level and trade openness. The results confirmed that income, price level, exchange rate, trade openness and external debt are key determinants of import demand in Nigeria. Based on these findings, the study further recommended an increase in income and trade restriction, and a review of investment climate in order to stimulate growth in the Nigerian economy.
3. Methodology

3.1 Model Specification

The study estimates both the aggregated (Model 1) and disaggregated (Models 2-4) import demand functions. The disaggregated import demand includes the import demand for consumer goods (Model 2), import demand for intermediate goods (Model 3), and import demand for capital goods (Model 4). The study follows studies such as Yahia (2015), Dutt and Ahmed (2004), Anaman et al. (2001), among others, and specifies the four models as follows:

**Model 1: Aggregate Import Demand for Goods and Services**

\[ \text{AIMD} = f(\text{GNI INV EX RP GE CE TL}) \]  

(1)

**Model 2: Import Demand for Consumer Goods and Services**

\[ \text{IMDCON} = f(\text{GNI INV EX RP GE CE TL}) \]  

(2)

**Model 3: Import Demand for Intermediate Goods and Services**

\[ \text{IMDINT} = f(\text{GNI INV EX RP GE CE TL}) \]  

(3)

**Model 4: Import Demand for Capital Goods and Services**

\[ \text{IMDCP} = f(\text{GNI INV EX RP GE CE TL}) \]  

(4)

The econometric form of the model is expressed in a log form as:

**Model 1: Aggregate Import Demand for Goods and Services**

\[ \ln \text{AIMD}_t = \alpha_0 + \beta_1 \text{GNI}_t + \beta_2 \text{INV}_t + \beta_3 \text{LEX}_t + \beta_4 \text{LRP}_t + \beta_5 \text{LGE}_t + \beta_6 \text{GE}_t + \beta_7 \text{TL}_t + \varepsilon_t \]  

(5)

**Model 2: Import Demand for Consumer Goods and Services**
\[ \text{LIMDCON}_t = \alpha_0 + \beta_1 \text{GNI}_t + \beta_2 \text{LINV}_t + \beta_3 \text{LEX}_t + \beta_4 \text{LRP}_t + \beta_5 \text{LCE}_t + \beta_6 \text{LGE}_t + \beta_7 \text{TL}_t + \epsilon_t \] \hspace{1cm} (6)

**Model 3: Import Demand for Intermediate Goods and Services**

\[ \text{LIMDINT}_t = \alpha_0 + \beta_1 \text{GNI}_t + \beta_2 \text{LINV}_t + \beta_3 \text{LEX}_t + \beta_4 \text{LRP}_t + \beta_5 \text{LCE}_t + \beta_6 \text{LGE}_t + \beta_7 \text{TL}_t + \epsilon_t \] \hspace{1cm} (7)

**Model 4: Import Demand for Capital Goods and Services**

\[ \text{LIMDCP}_t = \alpha_0 + \beta_1 \text{GNI}_t + \beta_2 \text{LINV}_t + \beta_3 \text{LEX}_t + \beta_4 \text{LRP}_t + \beta_5 \text{LCE}_t + \beta_6 \text{LGE}_t + \beta_7 \text{TL}_t + \epsilon_t \] \hspace{1cm} (8)

Where AIMD is the aggregate import demand, IMDCON is the import demand for consumer goods, IMDINT is the import demand for intermediate goods, IMDCP is the import demand for capital goods, GNI is gross national income, INV is the investment expenditure, EX is the exports of goods and services, RP is the relative import price, CE is the consumer spending, GE is government spending, TL represents the dummy for trade liberalisation policy, \( L \) is the natural log and \( \epsilon_t \) is the white noise error term.

### 3.1. Estimation Techniques

#### 3.1.1. Unit root testing

To examine the determinants of import demand in Tanzania, the study utilises the newly developed autoregressive distributed lag (ARDL) bounds testing approach developed by Pesaran and Pesaran (1997). The ARDL approach does not require unit root testing, however, it is necessary to first test for unit root in order to ensure that the produced results are reliable, and to ensure that none of the variables are integrated of I(2) or more (Bartholomew, 2010).
To test for unit root, the study employs the Dickey Fuller Generalised Square (DF-GLS), Phillips-Parron and Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) tests.

3.1.2. The Autoregressive Distributed Lag Bounds Testing Approach

The ARDL method is preferred in this study because, firstly, unlike the other normally used econometric co-integration methods, such as the Engle and Granger (1978) two-staged method and the Johanssen and Juselius (1990) method, it does not require that all the series be integrated of the same order. Secondly, it can be applied regardless of whether the regressors are integration of I (0), I (1) or equally integrated, as long as they are not integrated of I (2) or more (Pesaran et al., 2001). Thirdly, it is valid even for small sample data sets and on variables with different optimal lags. Lastly, with ARDL, the Error Correction Model (ECM) can be derived from the ARDL model through a simple linear transformation, which integrates short-run adjustments with long-run equilibrium without losing long-run information (Thao and Hua, 2016). Following the ARDL approach to co-integration, Models 1-4 are expressed as follows:

Model 1: Aggregate Import Demand for Goods and Services

\[ \Delta LAIMD_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta LAIMD_{t-i} + \sum_{i=0}^{n} \alpha_{2i} \Delta GNI_{t-i} + \sum_{i=0}^{n} \alpha_{3i} \Delta INV_{t-i} \]
\[ + \sum_{i=0}^{n} \alpha_{4i} \Delta EX_{t-i} + \sum_{i=0}^{n} \alpha_{5i} \Delta LCE + \sum_{i=0}^{n} \alpha_{6i} \Delta GE_{t-i} + \sum_{i=0}^{n} \alpha_{7i} \Delta R\text{PR}_{t-i} \]
\[ + \sum_{i=0}^{n} \alpha_{8i} \Delta TL_{t-i} + \sigma_1 \Delta LAIMD_{t-1} + \sigma_2 \Delta GNI_{t-1} + \sigma_3 \Delta INV_{t-1} + \sigma_4 \Delta EX_{t-1} \]
\[ + \sigma_5 \Delta LCE_{t-1} + \sigma_6 \Delta GE_{t-1} + \sigma_7 \Delta R\text{PR}_{t-1} + \sigma_8 \Delta TL_{t-1} + u_t \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (9) \]

Model 2: Import Demand for Consumption Goods and Services
\[
\Delta LIMDCON_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta LIMDCON_{t-i} + \sum_{i=0}^{n} \alpha_{2i} \Delta GNI_{t-i} + \sum_{i=0}^{n} \alpha_{3i} \Delta LINV_{t-i} \\
+ \sum_{i=0}^{n} \alpha_{4i} \Delta LEX_{t-i} + \sum_{i=0}^{n} \alpha_{5i} \Delta LCE + \sum_{i=0}^{n} \alpha_{6i} \Delta LGE_{t-i} + \sum_{i=0}^{n} \alpha_{7i} \Delta LRP_{t-i} \\
+ \sum_{i=0}^{n} \alpha_{8i} \Delta TL_{t-i} + \sigma_1 LIMDCON_{t-1} + \sigma_2 GNI_{t-1} + \sigma_3 LINV_{t-1} + \sigma_4 LEX_{t-1} \\
+ \sigma_5 LCE_{t-1} + \sigma_6 LGE_{t-1} + \sigma_7 LRP_{t-1} + \sigma_8 TL_{t-1} + u_t \ldots \ldots \ldots \ldots \ldots (10)
\]

Model 3: Import Demand for Intermediate Goods and Services

\[
\Delta LIMDINT_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta LIMDINT_{t-i} + \sum_{i=0}^{n} \alpha_{2i} \Delta GNI_{t-i} + \sum_{i=0}^{n} \alpha_{3i} \Delta LINV_{t-i} \\
+ \sum_{i=0}^{n} \alpha_{4i} \Delta LEX_{t-i} + \sum_{i=0}^{n} \alpha_{5i} \Delta LCE + \sum_{i=0}^{n} \alpha_{6i} \Delta LGE_{t-i} + \sum_{i=0}^{n} \alpha_{7i} \Delta LRP_{t-i} \\
+ \sum_{i=0}^{n} \alpha_{8i} \Delta TL_{t-i} + \sigma_1 LIMDINT_{t-1} + \sigma_2 GNI_{t-1} + \sigma_3 LINV_{t-1} + \sigma_4 LEX_{t-1} \\
+ \sigma_5 LCE_{t-1} + \sigma_6 LGE_{t-1} + \sigma_7 LRP_{t-1} + \sigma_8 TL_{t-1} + u_t \ldots \ldots \ldots \ldots \ldots (11)
\]

Model 4: Import Demand for Capital Goods and Services

\[
\Delta LIMDCP_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta LIMDCP_{t-i} + \sum_{i=0}^{n} \alpha_{2i} \Delta GNI_{t-i} + \sum_{i=0}^{n} \alpha_{3i} \Delta LINV_{t-i} \\
+ \sum_{i=0}^{n} \alpha_{4i} \Delta LEX_{t-i} + \sum_{i=0}^{n} \alpha_{5i} \Delta LCE + \sum_{i=0}^{n} \alpha_{6i} \Delta LGE_{t-i} + \sum_{i=0}^{n} \alpha_{7i} \Delta LRP_{t-i} \\
+ \sum_{i=0}^{n} \alpha_{8i} \Delta TL_{t-i} + \sigma_1 LIMDCP_{t-1} + \sigma_2 GNI_{t-1} + \sigma_3 LINV_{t-1} + \sigma_4 LEX_{t-1} \\
+ \sigma_5 LCE_{t-1} + \sigma_6 LGE_{t-1} + \sigma_7 LRP_{t-1} + \sigma_8 TL_{t-1} + u_t \ldots \ldots \ldots \ldots \ldots (12)
\]
Where: $\Delta$ is the first difference, $L$ is the logarithm, $i$ is the number of lags, $u_t$ is the white noise error term, $\alpha_0$ is a constant, $\sigma_1 - \sigma_8$ are the coefficients of the long-run ARDL model, $\alpha_1 - \alpha_8$ are short-run coefficients.

The first step of the ARDL is to test for co-integration using the ordinary least squares (OLS) method. This is done by computing the F-statistics for each model. The achieved F-statistics are assessed against lower and higher critical bounds provided in Pesaran and Pesaran (1997) and Pesaran et al. (2001). The lower critical bound assumes that all the tested regressors are integrated of I(0), while the upper critical bound assumes that all the variables are integrated of I(1) (Pesaran, 2001). If the computed F-statistics are below the lower critical bound, it can be concluded that the variables are not co-integrated and the null hypothesis of no co-integration cannot be rejected. If the F-statistics are between the lower and upper critical bounds, the test is inconclusive. If the F-statistics is higher than the upper critical bound, it can be concluded that the variables are co-integrated and the null hypothesis of no co-integration can be rejected. If the findings confirm that the tested variables are co-integrated, the study then estimates the long-run and short-run coefficients using the ARDL methods. The ECM of the models in this study is specified as:

**Model 1: Aggregate Import Demand for Goods and Services**

$$
\Delta LAIMD_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta LAIMD_{t-i} + \sum_{i=0}^{n} \alpha_{2i} \Delta GNI_{t-i} + \sum_{i=0}^{n} \alpha_{3i} \Delta LINV_{t-i} 
$$

$$
+ \sum_{i=0}^{n} \alpha_{4i} \Delta LEX_{t-i} + \sum_{i=0}^{n} \alpha_{5i} \Delta LCE + \sum_{i=0}^{n} \alpha_{6i} \Delta LGE_{t-i} + \sum_{i=0}^{n} \alpha_{7i} \Delta LRPE_{t-i}
$$

$$
+ \sum_{i=0}^{n} \alpha_{8i} \Delta TL_{t-i} + \delta_1 ECM_{t-1} + u_t \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (13)
$$
Model 2: Import Demand for Consumer Goods and Services

\[
\Delta LIMDCON_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta LIMDCON_{t-i} + \sum_{i=0}^{n} \alpha_{2i} \Delta GNI_{t-i} + \sum_{i=0}^{n} \alpha_{3i} \Delta LINV_{t-i} \\
+ \sum_{i=0}^{n} \alpha_{4i} \Delta LEX_{t-i} + \sum_{i=0}^{n} \alpha_{5i} \Delta LCE + \sum_{i=0}^{n} \alpha_{6i} \Delta LGE_{t-i} + \sum_{i=0}^{n} \alpha_{7i} \Delta LRP_{t-i} \\
+ \sum_{i=0}^{n} \alpha_{8i} \Delta TL_{t-i} + \delta_1 ECM_{t-1} + u_t \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (14)
\]

Model 3: Import Demand for Intermediate Goods and Services

\[
\Delta LIMDINT_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta LIMDINT_{t-i} + \sum_{i=0}^{n} \alpha_{2i} \Delta GNI_{t-i} + \sum_{i=0}^{n} \alpha_{3i} \Delta LINV_{t-i} \\
+ \sum_{i=0}^{n} \alpha_{4i} \Delta LEX_{t-i} + \sum_{i=0}^{n} \alpha_{5i} \Delta LCE + \sum_{i=0}^{n} \alpha_{6i} \Delta LGE_{t-i} + \sum_{i=0}^{n} \alpha_{7i} \Delta LRP_{t-i} \\
+ \sum_{i=0}^{n} \alpha_{8i} \Delta TL_{t-i} + \delta_1 ECM_{t-1} + u_t \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (15)
\]

Model 4: Import Demand for Capital Goods and Services

\[
\Delta LIMDCP_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta LIMDCP_{t-i} + \sum_{i=0}^{n} \alpha_{2i} \Delta GNI_{t-i} + \sum_{i=0}^{n} \alpha_{3i} \Delta LINV_{t-i} \\
+ \sum_{i=0}^{n} \alpha_{4i} \Delta LEX_{t-i} + \sum_{i=0}^{n} \alpha_{5i} \Delta LCE + \sum_{i=0}^{n} \alpha_{6i} \Delta LGE_{t-i} + \sum_{i=0}^{n} \alpha_{7i} \Delta LRP_{t-i} \\
+ \sum_{i=0}^{n} \alpha_{8i} \Delta TL_{t-i} + \delta_1 ECM_{t-1} + u_t \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (16)
\]

Where ECM is the error correction term and \( \delta_1 \) is the coefficient of the error correction term.
3.1.3 Data Sources

In this study, annual time series covering the period from 1985 to 2015 is utilised. The data for aggregate import demand, gross national income, investment spending, government spending, consumer spending, and exports of goods and services is collected from the United Nations Conference on Trade and Development (UNCTAD) database (UNCTAD, 2015). The data on import demand for consumer goods, intermediate goods and capital goods is sourced from Quantec easy data (Quantec, 2015) and the World Bank (2015).

4. Empirical results

4.1 Unit root

The results from the Dickey Fuller Generalised Square (DF-GLS), Phillips-Parron and the Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) tests 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>No Trend</td>
<td>Trend</td>
<td>No Trend</td>
</tr>
<tr>
<td>GNI</td>
<td>4.129</td>
<td>-4.111</td>
<td>-3.684**</td>
</tr>
<tr>
<td>LINV</td>
<td>0.481</td>
<td>-1.698</td>
<td>-4.329**</td>
</tr>
<tr>
<td>LEX</td>
<td>0.026</td>
<td>-3.552</td>
<td>-6.572**</td>
</tr>
<tr>
<td>LGE</td>
<td>-0.704</td>
<td>-1.991</td>
<td>-3.293**</td>
</tr>
<tr>
<td>LCE</td>
<td>1.818</td>
<td>-1.741</td>
<td>-2.365**</td>
</tr>
<tr>
<td>LRP</td>
<td>-0.425</td>
<td>-1.055</td>
<td>-3.411**</td>
</tr>
<tr>
<td>LAIMD</td>
<td>-0.068</td>
<td>-2.792</td>
<td>-4.830**</td>
</tr>
<tr>
<td>LIMDINT</td>
<td>-1.899</td>
<td>-4.542**</td>
<td>-5.322**</td>
</tr>
<tr>
<td>LIMDCON</td>
<td>-0.209</td>
<td>-1.714</td>
<td>-3.109**</td>
</tr>
<tr>
<td>LIMDCP</td>
<td>-1.107</td>
<td>-3.016</td>
<td>-4.716**</td>
</tr>
</tbody>
</table>

*Note: ** indicate statistical significance at the 5% levels, respectively.*
The results from the DF_GLS, PP, and KPSS unit root tests confirm that the tested variables are stationary either in levels and integrated of order zero [I(0)] or stationary after first differencing and integrated of order one [I(1)]. In other words, none of these variables are integrated of order two [I(2)] or more, and permit the use of the ARDL model to examine the determinants of import demand.

4.1. Cointegration Test

With the ARDL bounds test the F-statistics for each of the four models is computed using the ordinary least squares (OLS) method and are compared to the asymptotic critical values provided by Pesaran (2001). The critical values are, for instance where all regressors are integrated of I(0) and where all regressors are integrated of I(1). They are used as bounds in cases where the regressors are a mixture of I(0) and I(1). For all the models, the data series used for all the variables is in real terms.

Table 2 presents the co-integration results for the four models

| TABLE 2: ARDL Bound Test Results for Co-integration |
|---------------------------------------------|------------------|------------------|------------------|
| Country          | Estimated Model                  | F-statistics | Co-integration Status |
| Model 1          | AIMD = f(AIMD|GNI INV EX CE GE RP TL) | 4.528**       | Co-integrated     |
| Model 2          | IMDCON = f(IMDCON|GNI INV EX CE GE RP TL) | 5.447*        | Co-integrated     |
| Model 3          | IMDINT = f(IMDINT|GNI INV EX CE GE RP TL) | 4.611**       | Co-integrated     |
| Model 4          | IMDCP = f(IMDCP|GNI INV EX CE GE RP TL) | 3.413**       | Co-integrated     |
| Pesaran et al. (2001), p.300, Table | Asymptotic Critical Values | 1% | 5% | 10% |
The results confirm that there is co-integration between aggregate import demand and its determinants for all the four modes. The F-statistics for Model 1-4 are 4.528, 5.447, 4.611 and 3.413, respectively. The F-tests are greater than the upper bound asymptotic critical values provided by Pesaran (2001) in Table CI (iii) case III at 5% and 1% significance levels. Given this, the study estimates the long-run and short-run relationships between aggregate import demand and its determinants with the appropriate lag length. The lag length for Model 1-4 is selected through own selection. The appropriate lag lengths for these models are ARDL(1,1,0,1,0,1,0,1), ARDL(2,0,0,2,1,0,1), ARDL(2,0,0,0,2,0,1,2) and ARDL(2,0,0,0,0,0,1,0), respectively.

4.1.1. Long-run and Short-run Elasticities

Table 3 presents the long-run and short-run results for the Models1-4.

Table 3: Long-Run Results

<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>-0.787(-1.615)</td>
<td>0.170(0.143)</td>
<td>-0.735(-0.721)</td>
<td>0.015(0.011)</td>
</tr>
<tr>
<td>LEX</td>
<td>0.756(3.238)***</td>
<td>0.962(1.640)</td>
<td>0.904(1.936)*</td>
<td>1.363(2.403)**</td>
</tr>
<tr>
<td>LGE</td>
<td>-0.302(-0.993)</td>
<td>-0.054(-0.111)</td>
<td>-0.707(-1.496)</td>
<td>0.462(0.692)</td>
</tr>
<tr>
<td>GNI</td>
<td>0.095(1.275)</td>
<td>0.344(2.603)**</td>
<td>0.261(2.508)**</td>
<td>0.124(1.194)</td>
</tr>
<tr>
<td></td>
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<tr>
<td>----------</td>
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<td>------------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>LINV</td>
<td>1.074(2.752)**</td>
<td>0.254(0.403)</td>
<td>0.893(1.633)</td>
<td>-1.257(-1.525)</td>
</tr>
<tr>
<td>LRP</td>
<td>-0.043(-0.079)</td>
<td>0.002(0.360)</td>
<td>-0.007(-1.380)</td>
<td>0.024(2.898)***</td>
</tr>
<tr>
<td>TL</td>
<td>-0.459(-1.645)</td>
<td>-1.011(-2.202)**</td>
<td>-0.884(-2.057)*</td>
<td>0.479(0.734)</td>
</tr>
<tr>
<td>INPT</td>
<td>3.7122(1.1979)</td>
<td>2.395(0.341)</td>
<td>10.823(1.768)</td>
<td>4.764(0.629)</td>
</tr>
</tbody>
</table>

**Panel B: Long Run Results**

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>dLCE</td>
<td>-0.499(-2.123)**</td>
<td>0.129 (0.142)</td>
<td>-0.858(-0.755)</td>
<td>0.018(0.011)</td>
</tr>
<tr>
<td>dLEX</td>
<td>0.479(5.052)***</td>
<td>0.733(1.745)*</td>
<td>1.056(2.017)*</td>
<td>1.629(2.244)**</td>
</tr>
<tr>
<td>dLGE</td>
<td>0.121(0.732)</td>
<td>-0.041(-0.111)</td>
<td>-0.825(-1.477)</td>
<td>0.552(0.708)</td>
</tr>
<tr>
<td>dGNI</td>
<td>0.012(0.415)</td>
<td>0.111(2.004)*</td>
<td>0.100(1.275)</td>
<td>0.148(1.223)</td>
</tr>
<tr>
<td>dGNII</td>
<td>_</td>
<td>-0.113(-2.112)**</td>
<td>-0.127(-1.859)*</td>
<td>_</td>
</tr>
<tr>
<td>dLIMCON1</td>
<td>_</td>
<td>0.531(3.599)***</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td>dLIMINT1</td>
<td>_</td>
<td>_</td>
<td>0.290(1.346)</td>
<td>_</td>
</tr>
<tr>
<td>dLIMCP1</td>
<td>_</td>
<td>_</td>
<td>_</td>
<td>0.632(3.174)***</td>
</tr>
<tr>
<td>dLINV</td>
<td>1.121(5.726)***</td>
<td>0.639(1.264)</td>
<td>1.042(1.707)</td>
<td>-1.502(-1.528)</td>
</tr>
<tr>
<td>dLRP</td>
<td>-0.027(-0.078)</td>
<td>0.002(0.359)</td>
<td>0.006(0.753)</td>
<td>0.024(1.925)*</td>
</tr>
<tr>
<td>dTL</td>
<td>-0.525(-3.197)***</td>
<td>-1.023(-2.844)*</td>
<td>-0.565(-1.086)</td>
<td>0.573(0.722)</td>
</tr>
<tr>
<td>DTL1</td>
<td>_</td>
<td>_</td>
<td>0.194(0.482)</td>
<td>_</td>
</tr>
<tr>
<td>ecm(-1)</td>
<td>-0.633(-4.034)***</td>
<td>-0.762(-5.115)***</td>
<td>-1.167(-4.458)***</td>
<td>-1.195(-5.527)***</td>
</tr>
<tr>
<td>R-Squared</td>
<td>0.894</td>
<td>0.871</td>
<td>0.843</td>
<td>0.673</td>
</tr>
<tr>
<td>DW-statistic</td>
<td>1.987</td>
<td>1.948</td>
<td>2.038</td>
<td>2.244</td>
</tr>
</tbody>
</table>
The long- and short-run results for Model 1 are presented in Panel A and B respectively. The results show that exports of goods and services (LEX), investment spending (LINV) and trade liberalisation policy (TL) are the key determinants of aggregate import demand. As presented in Panel A, the long-run coefficients confirm that LEX and LINV are positive long-run determinants of aggregate import demand. It is found that a 1% increase in LEX and LINV leads to a 0.76% and 1.07% long-run increase in aggregate import demand, respectively. The short-run results presented in panel B suggest that LEX and LINV are positive short-run determinants of aggregate import demand, while TL is a negative short-run determinant. The short-run coefficients suggest that a 1% increase in LEX and LINV leads to a respective 0.48% and 1.12% increase in aggregate import demand, while a 1% increase TL leads to a 0.53% decrease in aggregate import demand, respectively. With the exception of trade liberalisation policy, the coefficients of these variables carry the theoretically expected signs and are significant at either 1% or 5%. The results suggest that gross national income (GNI), government spending (GE), consumer spending (CE) and relative import price (RP) have no significant effect on aggregate import demand, both in the long run and the short run. The negative effect of trade liberalisation policy contradicts theory; however, it finds support in studies such as Samuel (2015).
For Model 2, the long-run and short-run results suggest that gross national income (GNI), trade liberalisation policy (TL), exports of goods and services (LEX), import demand for consumer goods in the previous period (LIMCON1) and gross national income in the previous period (GIN1) are the key determinants of import demand for consumer goods. The long-run results presented in Panel A suggest that GNI is a positive determinant of import demand for consumer goods, but TL is a negative determinant. A 1% increase in these variables result in a 0.34% increase and 1.01% decrease in import demand for consumer goods, respectively. The short-run coefficients suggest that GNI, LIMCON1 and LEX are positive determinants, while GNI1 and TL are negative determinants. The findings show that a 1% increase in GNI, LIMCON1 and LEX leads to a 0.11%, 0.53% and 0.73% short-run increase in import demand for consumer goods, respectively, while a 1% increase in GNI1 and TL result in 0.11% and 1.02% decrease, respectively.

The results for Model 3 confirm that import demand for intermediate goods is determined by exports of goods and services (LEX), gross national income (GNI), investment spending (TL), and gross national income in the previous period (GNI1). The long-run coefficients confirm that LEX and GNI are positive determinants of import demand for intermediate goods, while TL is a negative determinant. The findings show that a 1% increase in LEX, GNI and TL result in a 0.90% increase, 0.26% increase and 0.88% decrease in import demand for intermediate goods. The short-run coefficients confirm that LEX, and GNI1 are positive and negative determinants of import demand for intermediate goods, respectively. According to the results presented in Panel B, a 1% increase in these variables result in a 1.05% increase and 0.13% decrease in import demand for intermediate goods, respectively. The negative effect of gross national income and trade liberalisation policy contradicts theory; however, it is supported in studies such as Baek (2015).
For Model 4, the long-run and short-run findings confirm that exports of goods and services (LEX) and relative import price (LRP) are key determinants of import demand for capital goods. The long-run findings confirm that LEX and LRP are positive determinants of import demand for capital goods. According to the results presented in Panel A, a 1% increase in these variables result in 1.36% and 0.02% in import demand for capital goods. The short results reveal that LEX, RP and LIMCP1 are positive determinants of import demand for capital goods. It is found that a 1% increase in these variables result in a 1.63%, 0.2% and 0.63% increase in import demand for capital goods. The positive effect of relative import price is not as theoretically expected; however, the results are supported in Chen (2008) and Budha (2014). For all the four models, the coefficients of the error correction terms are negative and statistically significant at 1% level.

Generally, the results suggest that exports of goods and services are positive long-run determinants of import demand in Models 1, 3 and 4, but have no significant effect in Model 2. In the short run, the results confirm that exports of goods and services have a significant effect across all the four models. Consumer spending and government spending are found to have no significant effect both in the long run and short run, and across all the four models. Figure 1 presents the Cumulative Sum (CUSUM) and Cumulative Sum of Squares (CUSUMSQ) tests.
The CUSUM and CUSUMSQ results confirm that all the four estimated models are stable.

5. Conclusion

The study examined the determinants of aggregated 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) in the case of Tanzania. The study applied the newly
developed ARDL bounds testing approach to the analysis of annual time series data covering the period from 1985 to 2015. The estimated determinants include gross national income (GNI), investment spending (INV), exports of goods and services (EX), government spending (GE), Consumer spending (CE), and relative import price (RP) and trade liberalisation policy (TL).

The results for Model 1 confirm that exports of goods and services and investment spending are positive long-run and short-run determinants of aggregate import demand for goods and services, while trade liberalisation policy is a negative determinant only in the short run. For Model 2, the results reveal that gross national income is a positive long-run and short-run determinant of import demand for consumer goods, while trade liberalisation policy is a negative long-run and short-run determinant. The short run results further confirm that exports of goods and services and import demand for consumer goods in the previous period are positive determinants of import demand for consumer goods only in the short run, while gross national income in the previous period is a negative determinant.

In Model 3, the findings suggest that import demand for intermediate goods is positively determined by exports of goods and services both in the long run and in the short run, but negatively determined by trade liberalisation policy and gross national income in the previous period in the long run and short run, respectively. The results further show that gross national income is a positive determinant of import demand for intermediate goods only in long run. For Model 4, the results suggest that import demand for capital goods is positively determined by exports of goods and services and relative import price both in the long run and short run, while positively determined by import demand for capital goods in the previous period only in the short run.
Overall, the results confirm that exports of goods and services, gross national income, investment spending and trade liberalisation policy are key determinants of import demand in Tanzania. The results further confirm that each of these variables has a significant effect on import demand in at least two models. Furthermore, export of goods and services appears to be influential in almost all the models.

6. References


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