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THE DETERMINANTS OF AGGREGATE AND DISAGGREGATED IMPORT DEMAND IN GHANA

Abstract

This paper examines the determinants of both aggregate and disaggregated import demand in the case of Ghana for the period from 1985 to 2015. The study employed the newly developed autoregressive distributed lag (ARDL) bounds testing approach. The explanatory variables employed include gross national income, exports of goods and services, consumer spending, government spending, investment spending, relative import price and trade liberalisation policy. The study finds that in the long run, aggregate import demand is positively determined by exports of goods and services and consumer spending. However, it was found to be negatively determined by relative import price, trade liberalisation policy and government spending. The results further confirm that gross national income, exports of goods and services and consumer spending are positive long-run and short-run determinants of import demand for consumer goods. It is found that in the long run, import demand for intermediate goods is positively determined by government spending and consumer spending, but negatively determined by exports of goods and services. Import demand for capital goods is found to be positively determined by gross national income and exports of goods and services, but negatively determined by investment spending in the long run. The short-run findings suggest that aggregate import demand is positively affected by exports of goods and services, investment spending and consumer spending, but negatively affected by relative import price and trade liberalisation policy. Import demand for consumer goods is positively influenced by consumer spending. Finally, import demand for intermediate goods is found to be positively determined by investment spending, government spending and consumer spending, while import demand for capital goods is positively associated with exports of goods and services and investment spending in the previous period, but negatively associated with previous period gross national income, investment spending and government spending.

Key words: ARDL Approach, Import demand, Ghana

JEL Codes: F1

1. Introduction

International trade has become one of the key drivers of economic growth in many countries. In the case of Ghana, the contribution of international trade to economic growth has increased since the early 1980s. This is attributable to the country's attainment of democracy in 1957, and the establishment of the World Trade Organisation (WTO). Estimates from the World Bank (2015) show that the share of international trade to economic growth has increased from 6.4% in 1980 to 88.6% in 2015. They also show that the increased contribution of foreign trade is driven by the increase in imports, which implies an increase in the country's trade deficit. Over the period from 1980 to 2015, the share of imports to economic growth has increased from 9.2% in 1980 to 47.9% in 2015, and this has been higher than the contribution of exports over the years.

Alam and Ahmed (2010) defined imports as an excess of domestic consumption over domestic supply. Theoretically, when imports are greater than exports it is an indication that a country does not benefit from trade. This is because the demand for both imports and exports explains the country's terms of trade, balance of payments and current account balance. In literature, there are conflicting views regarding the importance of imports for a country. According to Chani *et al.,* (2011), the first view opposes free trade policies, arguing that high import demand may have a negative impact on a country's balance of payments. Furthermore, the proponents of this view advocate for import substitution and fair trade, because they believe that free trade may be harmful to economic development, especially in developing countries (Chani *et al.,* 2011). On the other hand, the proponents of the second view argue that free trade encourages competition and leads to economic efficiency (Langenfeld and Nieberding, 2015). In light of this, the main aim of this paper is to examine the key determinants of both aggregate and disaggregated import demand in Ghana. A number of studies have estimated the import demand function. However, most of these studies estimated the aggregate import demand model. To our knowledge, there is no study that has extensively investigated the disaggregated import demand function in Ghana.

The rest of the paper is organised as follows: Section 2 provides theoretical and empirical literature on import demand. Section 3 presents the model specifications and the econometric methodology used in the study. Empirical results are presented in section 4. Lastly, section 5 concludes the paper.

2. Literature Review

In literature, the major theories explaining the import demand function include the imperfect substitution theory, Keynesian theory, neo-classical theory, monetarist theory, and production theory. The four theories emphasise the importance of income, price and exchange rates in the determination of trade (Hong, 1999). Numerous empirical studies have been carried out in an attempt to empirically examine the determinants of import demand in both developing and developed countries. Abbott and Seddighi (1996) examined the long-run effects of macroeconomic components on aggregate import demand for the United Kingdom, using the Johansen multivariate co-integration approach on annual data covering the period from 1972 to 1990. The estimated model included consumer spending, government spending, investment spending, exports of goods and services and relative import prices as explanatory variables. The results suggested that all the explanatory variables are significant determinants of import demand. Furthermore, the results revealed that the level of importance of the different components of income differs, and private expenditure appeared to be the most significant factor.

Sinha and Sinha (2000) carried out a similar study for Greece using the Johansen's co-integration method and a time series data covering the period from 1951 to 1992. The estimated model included relative import price and income as independent variables. The results showed that aggregate import demand is highly income-elastic and price-inelastic.

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

Chinn (2003) tested the existence of a relationship between import demand and its determinants for the United States of America over the period from 1975 to 2001. The study used the Johansen's co-integration approach, and the results showed that exchange rates and real income have no significant impact on import demand.

Using the bounds test approach, Bahamani and Kara (2003) estimated the import demand function for nine industrial countries that is Australia, Austria, Canada, France, Germany, Denmark, Italy, Japan and the USA. The study covered the period from 1973Q1 to 1998Q2. It was found that in the long run, income has a significant influence on import demand, but has no influence in the short run.

Tsionas and Christopoulos (2004) estimated the import demand function for France, Italy, the Netherlands, the UK, and the US for the period from 1960 to 1999 using Ordinary Least Squares and Johansen's co-integration approach. They specified import demand as a function of relative import price and income, and the results confirmed significant effects of relative prices and incomes, and short-run effects from temporary shocks.

Arize and Osang (2007) studied the determinants of import demand, focusing on the impact of foreign exchange reserves in Latin America. They applied the Johansen's co-integration approach using on a quarterly data covering the period from 1973Q2 to 1999Q1. The estimated model included foreign exchange reserves, income and relative prices index as potential determinants. The findings showed that the three variables have a significant impact on import demand. Also, it was found that the foreign exchange reserve is the least significant determinant when compared to income and relative prices index.

Alexiou (2010) examined the effects of government expenditure on import demand for Greece using the bounds test during period 1970-2007. The results suggest that public expenditure has a positive effect on import demand.

Jiranyakul (2013) studied the impact of real exchange rate uncertainty on import demand of Thailand using the bounds test over the period July 1997 to December 2011. In the estimated model real income and real exchange uncertainty was also used as an explanatory variable. The results showed that both income and exchange rate uncertainty have an impact on import demand. It was found that the exchange rate uncertainty has a negative effect on Thailand's imports.

In 2015, Baek studied Korea's import demand behaviour using the bounds test over the period from 1989Q1 to 2014Q2. The results confirmed a long-run relationship between imports and income, and relative prices. Also, income was found to be the most influential factor for Korea's imports in the short run and in the long run, while prices only have a significant impact in the short run.

3. Estimation Techniques and Empirical Analysis

3.1.Model Specification

In modelling the import demand function for Ghana, the study follows the imperfect substitution, Neo-classical, and Keynesian theories. In line with the traditional import demand model, these theories suggest that national income and relative import price have a significant influence on a country's import demand. The traditional import demand model is specified as:

$$AIMD_t = f(Y_t, RP_t) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots. (1)$$

Where AIMD is the import demand variable, Y is the aggregate income variable and RP is the relative import price. Recent literature has used a reformed model that includes additional explanatory variables into the traditional model (see, among others: Anaman et al., 2001; Modeste, 2011; Omoke, 2012). The additional variables include exports of goods and services, investment spending, government spending, consumer spending and a dummy variable for trade liberalisation policy.

In this paper, both the aggregated and disaggregated import demand functions are estimated. According to McAleese (1970), the main issue with estimating only the aggregated import demand function is that it can result in "aggregation bias", as the different import groups may respond differently to the changes in certain variables. The disaggregated import demand model takes three forms, that is, the import demand for consumer goods (Model 2), import demand for intermediate goods (Model 3), and import demand for capital goods (Model 4). Following Modeste (2011), Yahia (2015), Dutt and Ahmend (2004), Anaman *et al.* (2001) among others, the modified models are specified as follows:

Model 1: Aggregate Import Demand for Goods and Services

$$AIMD = f(GNI\ INV\ EX\ RP\ GE\ CE\ TL) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.. (2)$$

Model 2: Import Demand for Consumer Goods and Services

$$IMDCON = f(GNI\ INV\ EX\ RP\ GE\ CE\ TL) \dots\dots\dots\dots\dots\dots\dots\dots.\dots\dots\dots\dots. (3)$$

Model 3: Import Demand for Intermediate Goods and Services

$$IMDINT = f(GNI\ INV\ EX\ RP\ GE\ CE\ TL) \dots\dots\dots\dots\dots\dots.\dots\dots\dots\dots\dots.. (4)$$

Model 4: Import Demand for Capital Goods and Services

$$IMDCP = f(GNI\ INV\ EX\ RP\ GE\ CE\ TL) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots... (5)$$

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

Model 1: Aggregate Import Demand for Goods and Services

$$LAIMD_t = \alpha_0 + \beta_1 GNI_t + \beta_2 LINV_t + \beta_3 LEX_t + \beta_4 LRP_t + \beta_5 LCE_t + \beta_6 LGE_t + \beta_7 TL_t + \varepsilon_t \dots\dots\dots (7)$$

Model 2: Import Demand for Consumer Goods and Services

$$LIMDCON_t = \alpha_0 + \beta_1 GNI_t + \beta_2 LINV_t + \beta_3 LEX_t + \beta_4 LRP_t + \beta_5 LCE_t + \beta_6 LGE_t + \beta_7 TL_t + \varepsilon_t \dots\dots\dots (8)$$

Model 3: Import Demand for Intermediate Goods and Services

$$LIMDINT_t = \alpha_0 + \beta_1 GNI_t + \beta_2 LINV_t + \beta_3 LEX_t + \beta_4 LRP_t + \beta_5 LCE_t + \beta_6 LGE_t + \beta_7 TL_t + \varepsilon_t \dots\dots\dots (9)$$

Model 4: Import Demand for Capital Goods and Services

$$LIMDCP_t = \alpha_0 + \beta_1 GNI_t + \beta_2 LINV_t + \beta_3 LEX_t + \beta_4 LRP_t + \beta_5 LCE_t + \beta_6 LGE_t + \beta_7 TL_t + \varepsilon_t \dots\dots\dots (10)$$

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 (growth rate), 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 ε_t is the white noise error term.

3.2. Estimation Techniques

3.2.1. Unit root testing

To empirically examine the determinants of import demand in Ghana, the study employs the autoregressive distributed lag (ARDL) bounds testing approach. Although the ARDL approach does not require pretesting of the series for stationarity, it is important to carry out unit root tests before applying ARDL in order to reduce the possibility of producing spurious results. Furthermore, determining the order of integration for the tested variables is necessary in order to ensure that that none of the variables are integrated of I (2) or more (Onuonga, 2014). In this study, the Dickey Fuller Generalised Square (DF-GLS) test, Phillips-Parron test and the Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) test are used to test for stationarity.

3.2.2. The Autoregressive Distributed Lag Bounds Testing Approach

The ARDL method was developed by Pesaran and Pesaran (1997). The method is error correction-based and has numerous econometric advantages over the other commonly used co-integration methods, such as the Engle and Granger (1978) two-staged method and the Johansen and Juselius (1990) method. The advantages of the ARDL method are that, firstly; it does not require that all the series be integrated of the same order. Secondly; it can be applied in small sample data sets and on variables with different optimal lags. Thirdly, 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). Lastly, 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 (Nkoro and Uko, 2016). Following the ARDL approach to co-integration, Models 1-4 can be expressed as follows:

Model 1: Aggregate Import Demand for Goods and Services

$$\Delta LAIMD_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i}\Delta\, LAIMD_{t-i} + \sum_{i=0}^{n} \beta_{2i}\Delta GNI_{t-i} + \sum_{i=0}^{n} \beta_{3i}\Delta LINV_{t-i}$$

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

$$+ \sum_{i=0}^{n} \beta_{8i}\Delta TL_{t-i} + \alpha_1 LAIMD_{t-1} + \alpha_2 GNI_{t-1} + \alpha_3 LINV_{t-1} + \alpha_4 LEX_{t-1}$$

$$+ \alpha_5 LCE_{t-1} + \alpha_6 LGE_{t-1} + \alpha_7 LRP_{t-1} + \alpha_8 TL_{t-1} + u_t \ldots\ldots\ldots\ldots\ldots\ldots (11)$$

Model 2: Import Demand for Consumption Goods and Services

$$\Delta LIMDCON_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i}\Delta\, LIMDCON_{t-i} + \sum_{i=0}^{n} \beta_{2i}\Delta GNI_{t-i} + \sum_{i=0}^{n} \beta_{3i}\Delta LINV_{t-i}$$

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

$$+ \sum_{i=0}^{n} \beta_{8i}\Delta TL_{t-i} + \alpha_1 LIMDCON_{t-1} + \alpha_2 GNI_{t-1} + \alpha_3 LINV_{t-1} + \alpha_4 LEX_{t-1}$$

$$+ \, \alpha_5 LCE_{t-1} + \alpha_6 LGE_{t-1} + \alpha_7 LRP_{t-1} + \alpha_8 TL_{t-1} + u_t \ldots\ldots\ldots\ldots.\ldots\ldots\ldots (12)$$

Model 3: Import Demand for Intermediate Goods and Services

$$\Delta LIMDINT_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i}\Delta\, LIMDINT_{t-i} + \sum_{i=0}^{n} \beta_{2i}\Delta GNI_{t-i} + \sum_{i=0}^{n} \beta_{3i}\Delta LINV_{t-i}$$

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

$$+ \sum_{i=0}^{n} \beta_{8i}\Delta TL_{t-i} + \alpha_1 LIMDINT_{t-1} + \alpha_2 GNI_{t-1} + \alpha_3 LINV_{t-1} + \alpha_4 LEX_{t-1}$$

$$+ \, \alpha_5 LCE_{t-1} + \alpha_6 LGE_{t-1} + \alpha_7 LRP_{t-1} + \alpha_8 TL_{t-1} + u_t \ldots\ldots\ldots..\ldots\ldots (13)$$

Model 4: Import Demand for Capital Goods and Services

$$\Delta LIMDCP_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i}\Delta\, LIMDCP_{t-i} + \sum_{i=0}^{n} \beta_{2i}\Delta GNI_{t-i} + \sum_{i=0}^{n} \beta_{3i}\Delta LINV_{t-i}$$

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

$$+ \sum_{i=0}^{n} \beta_{8i}\Delta TL_{t-i} + \alpha_1 LIMDCP_{t-1} + \alpha_2 GNI_{t-1} + \alpha_3 LINV_{t-1} + \alpha_4 LEX_{t-1}$$

$$+ \, \alpha_5 LCE_{t-1} + \alpha_6 LGE_{t-1} + \alpha_7 LRP_{t-1} + \alpha_8 TL_{t-1} + u_t \ldots\ldots\ldots\ldots\ldots\ldots. (14)$$

where: Δ is the first difference, L is the logarithm, i is the number of lags, u_t is the white noise error term, β_0 is a constant, α_1-α_8 are the coefficients of the long-run ARDL model, β_1 - β_8, are short-run coefficients .

The first step of testing the null hypothesis of no co-integration against the alternative hypothesis of co-integration is to compute the F-statistics for each of the four models using the ordinary least squares (OLS) method. In computing the F-statistics, the estimated null hypothesis is of no co-integration against the alternative hypothesis of co-integration. Pesaran and Pesaran (1997) and Pesaran et al. (2001) provide lower and higher critical bounds against which the achieved F-statistics are assessed. With the lower critical bound, the assumption is that all the tested variables 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 is less than the lower critical bound, an inference can be made that the variables are not co-integrated and the null hypothesis of no co-integration cannot be rejected. If the F-statistics lies between the lower and upper critical bounds, the test is inconclusive and no inference can be made. If the F-statistics lie above 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 tested variables are co-integrated, the study proceeds to estimate the long-run and short-run coefficients using the ARDL methods. The ECM of the models in this study are specified as:

Model 1: Aggregate Import Demand for Goods and Services

$$\Delta LAIMD_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta\, LAIMD_{t-i} + \sum_{i=0}^{n} \beta_{2i} \Delta GNI_{t-i} + \sum_{i=0}^{n} \beta_{3i} \Delta LINV_{t-i}$$

$$+ \sum_{i=0}^{n} \beta_{4i} \Delta LEX_{t-i} + \sum_{i=0}^{n} \beta_{5i} \Delta LCE_{t-i} + \sum_{i=0}^{n} \beta_{6i} \Delta LGE_{t-i} + \sum_{i=0}^{n} \beta_{7i} \Delta LRP_{t-i}$$

$$+ \sum_{i=0}^{n} \beta_{8i} \Delta TL_{t-i} + \delta_1 ECM_{t-1} + u_t. \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (15)$$

Model 2: Import Demand for Consumer Goods and Services

$$\Delta LIMDCON_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i}\Delta\,LIMDCON_{t-i} + \sum_{i=0}^{n} \beta_{2i}\Delta GNI_{t-i} + \sum_{i=0}^{n} \beta_{3i}\Delta LINV_{t-i}$$

$$+ \sum_{i=0}^{n} \beta_{4i}\Delta LEX_{t-i} + \sum_{i=0}^{n} \beta_{5i}\Delta LCE_{t-i} + \sum_{i=0}^{n} \beta_{6i}\Delta LGE_{t-i} + \sum_{i=0}^{n} \beta_{7i}\Delta LRP_{t-i}$$

$$+ \sum_{i=0}^{n} \beta_{8i}\Delta TL_{t-i} + \delta_1 ECM_{t-1} + u_t.\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (16)$$

Model 3: Import Demand for Intermediate Goods and Services

$$\Delta LIMDINT_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i}\Delta\,LIMDINT_{t-i} + \sum_{i=0}^{n} \beta_{2i}\Delta GNI_{t-i} + \sum_{i=0}^{n} \beta_{3i}\Delta LINV_{t-i}$$

$$+ \sum_{i=0}^{n} \beta_{4i}\Delta LEX_{t-i} + \sum_{i=0}^{n} \beta_{5i}\Delta LCE_{t-i} + \sum_{i=0}^{n} \beta_{6i}\Delta LGE_{t-i} + \sum_{i=0}^{n} \beta_{7i}\Delta LRP_{t-i}$$

$$+ \sum_{i=0}^{n} \beta_{8i}\Delta TL_{t-i} + \delta_1 ECM_{t-1} + u_t.\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (17)$$

Model 4: Import Demand for Capital Goods and Services

$$\Delta LIMDCP_t = \beta_0 + \sum_{i=0}^{n} \beta_{1i}\Delta\,LIMDCP_{t-i} + \sum_{i=0}^{n} \beta_{2i}\Delta GNI_{t-i} + \sum_{i=0}^{n} \beta_{3i}\Delta LINV_{t-i}$$

$$+ \sum_{i=0}^{n} \beta_{4i}\Delta LEX_{t-i} + \sum_{i=0}^{n} \beta_{5i}\Delta LCE_{t-i} + \sum_{i=0}^{n} \beta_{6i}\Delta LGE_{t-i} + \sum_{i=0}^{n} \beta_{7i}\Delta LRP_{t-i}$$

$$+ \sum_{i=0}^{n} \beta_{8i}\Delta TL_{t-i} + \delta_1 ECM_{t-1} + u_t.\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (18)$$

Where ECM is the error correction term and δ_1 is the coefficient of the error correction term.

3.2.3. Data Sources

The study employs annual time series for the period 1985-2015. The data for aggregate import demand, total national income, investment spending, government spending, consumer spending, and exports of goods and services is sourced from 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

4.1.1. 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

Variable	Dickey Fuller Generalised Square				Phillips-Perron				Kwiatkowski, Phillips, Schmidt, and Shin			
	Stationarity at levels		Stationarity after first differencing		Stationarity at levels		Stationarity after first differencing		Stationarity at levels		Stationarity after first differencing	
	No Trend	Trend	No Trend	Trend	No Trend	Trend	No Trend	Trend	No Trend	Trend	No Trend	Trend
GNI	0.195	-1.56	4.418**	-4.420**	-0.424	-1.571	-4.318**	-4.217**	0.334**	0.142	_	0.118
LINV	-2.388	-4.428**	-6.729**	_	-2.633	-4.316**	-12.629**	_	0.371**	0.198	_	0.211**
LEX	0.245	-2.700	-4.977**	-5.530**	-0.847	-2.453	-8.127**	-8.230**	0.418**	0.175	_	0.189**
LRP	0.156	-1.724	2.668**	-3.850**	-3.905**	-7.182**	_	_	0.424**	0.241	_	0.161**
LGE	-2.6813**	-2.907	-	-5.173**	-1.878	-2.1067	-6.071**	-5.919**	0.286**	0.147**	_	_
LCE	0.493	-1.729	-4.149**	-4.609**	0.551	-2.121	-7.546**	-10.927**	0.276**	0.187**	_	_
LAIMD	-0.229	-3.311	-5.521**	-5.529**	-0.382	-2.838	-8.303**	-8.178**	0.403**	0.221	_	0.215**
LIMDINT	-0.021	-1.034	-4.869**	-5.498**	-0.261	-0.696	-5.041**	-6.345**	0.265	0.148	0.417**	_
LIMDCON	0.168	-3.966	-6.745**	-7.147**	-1.316	-4.021**	-11.654**	_	0.391**	0.184	_	0 .168**
LIMDCP	0.384	-2.834	-5.676**	-6.024**	-1.521	-2.373	-6.968**	-8.567**	0.400**	0.147	_	0.170**

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

The results from the DF_GLS, PP, and KPSS unit root tests confirm that the 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)]. This confirms that none of these variables are integrated of order two [I (2)] or more, and allows the use of the ARDL model to examine the determinants of import demand.

4.1.2. Co-integration

Before performing the ARDL bounds test, the existence of a long-run co-integration between the import demand variables and the explanatory variables is tested using the ordinary least squares (OLS). This is used to test the hypothesis of no co-integration against the alternative hypothesis by computing the F-statistics for each of the four models. The computed F-test is then assessed against the two asymptotic critical values bounds provided in Pesaran (2001).

The co-integration results for the four models are reported in Table 2.

TABLE 2: ARDL Bounds 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)			4.442**	Co-integrated
Model 2	IMDCON = f(IMDCON|GNI INV EX CE GE RP TL)			3.444*	Co-integrated
Model 3	IMDINT = f(IMDINT|GNI INV EX CE GE RP TL)			4.371**	Co-integrated
Model 4	IMDCP = f(IMDCP|GNI INV EX CE GE RP TL)			3.627**	Co-integrated
Pesaran *et al.* (2001), p.300, Table CI(iii) Case III	**Asymptotic Critical Values**				
	1%		5%		10%
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
	2.96	4.26	2.32	3.50	2.03	3.13

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

The results presented in Table 2 confirm that there is co-integration between the import demand and its determinants in Models 1-4. The F-statistics for the four models are 4.44, 3.44, 4.37and 3.63, respectively. Having established that the import demand variable and its determinants are co-integrated, the next step is to estimate the long-run and short-run relationships between import demand and its determinants using the appropriate lag length. The lag length for Model 1 is selected through the Akaike Information Criterion, while the lag length for Models 2-4 is

selected through own selection. The appropriate lag length for Models 1-4 are ARDL(1,1,1,1,1,1,0,0), ARDL(1,1,0,0,0,1,0,1), ARDL(1,01,1,0,0,0,1) and ARDL(2,2,0,2,2,0,0,0), respectively.

4.1.3. Long-Run and Short-Run Results

The long-run and short-run results for the Models1-4 are presented in Table 3.

Table 3: Long-Run Results

Panel A: Long Run Results				
Regressor	**Model 1**	**Model 2**	**Model 3**	**Model 4**
GNI	0.059(1.312)	0.399(2.856)***	0.016(0.081)	0.414(2.310)**
LEX	1.035(5.988)***	0.989(2.324)**	-0.858(-1.957)*	1.196(2.735)**
LINV	-0.337(-1.422)	0.414(0.143)	0.768(1.599)	-1.890(-1.787)*
LGE	-0.741(-2.504)**	-0.478(-0.868)	1.398(2.229)**	-0.442(-0.656)
LCE	0.987(3.099)***	1.651(1.914)*	1.901(2.482)**	0.380(0.578)
LRP	-1.393(-3.225)***	-1.255(-1.427)	0.831(1.111)	1.196(2.735)
TL	-0.431(-2.913)***	-0.395(-0.837)	-0.295(-0.788)	0.042(0.485)
INPT	6.392(1.3245)	-15.456 (-1.404)	-33.913(-2.691)	-0.269(-2.678)
Panel B: Short Run Results				
dLIMDCP1	_	_	_	-0.178(-0.929)
dGNI	0.004(0.659)	0.089(1.917)*	0.012(0.082)	0.011(0.522)
dGNI1	_	_	_	-0.033(-2.092)*
dLEX	0.632(11.562)***	0.638(1.953)*	-0.087(-0.544)	0.322(3.121)**
dLINV	0.230(0.659)***	0.038(0.142)	0.207(1.755)*	-0.217(-2.215)**
dLINV1	_	_	_	0.284(2.908)***
dLGE	-0.023(-0.289)	-0.309(-0.825)	0.483(2.198)**	-0.101(-0.569)
dLGE1	_	_	_	-0.326(-2.581)**
dLCE	1.748(12.640)***	1.863(2.551)**	0.656(2.178)**	0.102(0.551)
dLRP	-0.499(-6.719)***	-0.810(-1.640)	0.287(1.184)	-0.030(-0.193)
dTL	-0.155(-3.880)***	0.250(0.989)	0.040(0.287)	0.042(0.485)
ecm(-1)	-0.358(-3.688)***	-0.646(-3.238)***	-0.345(-3.242)***	-0.269(-2.678)**
R-Squared	0.979	0.556	0.544	0.641

DW-statistic	2.191	2.002	2.294	2.224
F-Statistics	93.270[0.000]	2.817 [0.027]	2.689[0.033]	3.574[0.008]
Serial Correlation	1.048[0.306]	0.021[0.884]	0.999[0.318]	0.173[0.677]
Functional Form	2.215[0.137]	7.268[0.007]	0.187[0.665]	1.715[0.190]
Normality	0.3711[0.831]	1.147[0.564]	4.341[0.114]	8.237[0.016]
Heteroscedasticity	1.992[0.158]	1.436[0.231]	0.047[0.829]	1.943[0.163]

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

The long- and short-run results for Model 1, presented in Panel A and B respectively, reveal that exports of goods and services (LEX), consumer spending (LCE), government spending (LGE), relative import price (LRP), investment spending (LINV) and trade liberalisation policy (TL) are the key determinants of aggregate import demand. The long-run coefficients presented in Panel A suggest that LEX and LCE are positive long-run determinants of aggregate import demand, while LGE, TL and LRP are negative long-run determinants. The findings confirm that a 1% increase in LEX and LCE leads to a 1.04% and 0.99% increase in aggregate import demand respectively, in the long run, while a 1% increase in LGE, LRP and TL leads to a 0.74%, 1.39% and 0.43% decrease in aggregate import demand, respectively. The short-run results are presented in Panel B, and they suggest that LEX, LINV and LCE are positive short-run determinants of aggregate import demand, while LRP and TL are negative short-run determinants. The short-run coefficients confirm that a 1% increase in LEX, LINV and LCE result in a 0.63%, 0.23% and 1.75% increase in aggregate import demand, but a 1% increase in LRP and TL leads to a 0.41% and 0.16% decrease in aggregate import demand, respectively. Gross national income (GNI) is found to have no significant effect on aggregate import demand, both in the long run and short run. The coefficients of the long-run and short-run determinants are significant at either 1% or 5%. The negative effect of LGE and TL are not as theoretically expected, but are supported in previous studies such as by Narayan and Narayan (2005).

The results for Model 2 confirm that import demand for consumer goods is determined by consumer spending (LCE), exports of goods and services (LEX) and gross national income (GNI). The long-run and short-run coefficients show that LCE, LEX and GNI are positive determinants of import demand for consumer goods. The long-run results presented in Panel A of the same table suggest that a 1% increase in LCE, LEX and GNI result in a 1.65%, 0.99% and 0.39% increase in import demand for consumer goods, respectively. As presented in Panel

B, the short-run coefficients suggest that a 1% increase in these variables leads to a 1.86%, 0.63% and 0.09% increase in import demand for consumer goods, respectively. The coefficients of these variables are statistically significant at either 1%, 5% or 10%. The coefficient signs of these variables are as theoretically expected and in line with the findings by Dutta and Ahmed (2004), Gunçavdi and Ulengin (2012) and Chen (2008). Trade liberalisation policy (TL), relative import price (LRP), investment spending (LINV) and government spending (LGE) are found to have no significant influence on import demand for consumer goods, both in the long run and short run.

The long-run and short-run results for Model 3 reveal that exports of goods and services (LEX), government spending (GE), investment spending (LINV) and consumer spending (CE) are the key determinants of import demand for intermediate goods. The long-run coefficients presented in Panel A show that LCE and LGE are positive long-run determinants of import demand for intermediate goods, while LEX is a negative determinant. The results show that a l% increase in LCE, LGE and LEX leads to a 1.31% increase, 1.90% increase and a 0.86% decrease in import demand for intermediate goods and services, respectively. The short-run results show that LINV, LGE and LCE are positive determinants of import demand. It is found that a 1% increase in these variables result in a 0.21%, 0.48% and 0.66% increase in import demand for intermediate goods, respectively. The coefficients of the long-run and short-run determinants of import demand for intermediate goods are statistically significant at either 5% or 1% level. Relative import price (LRP), gross national income (GNI) and trade liberalisation (TL) are found to have no significant effect on import demand for intermediate goods in Ghana. With the exception of exports of goods and services, the coefficient signs of the determinants of import demand for intermediate goods are in line with the theoretical expectations. These results find support in empirical studies such as Chani e*t al.* (2011);

For Model 4, the results show that exports of goods and services (LEX), gross national income (GNI), investment spending (LINV), first lagged values of gross national income (GNI1), first lagged values of investment spending (LINV1) and first lagged values of government spending (LGE1) are the key determinants of import demand for capital goods. The long-run coefficients presented in Panel A confirm that LEX and GNI are positive long-run determinants of import demand for capital goods, but LINV is a negative long-run determinant. A 1% increase in these variables results in a 1.11% increase, 0.41% increase and 1.89% decrease in import demand for capital goods, respectively. With the exception of LINV, the coefficients of these variables carry the theoretically expected sign and are statistically significant at 5% level. The short-run

coefficients presented in Panel B confirm that LEX, LINV1 are positive determinants of import demand for capital goods, while GNI1, LINV, and LGE1 are negative determinants. The results confirm that a 1% increase in LEX and LINV1 lead to a 0.32% and 0.28% increase in import demand for capital goods, while a 1% increase in GNI1, LINV, and LGE1 leads to a 0.03%, 0.22% and 0.33% decrease, respectively. The coefficients of the variables are statistically significant at either 1%, 5% or 10%. The coefficient signs of LINV1 and LEX are as theoretically expected and the results are supported in studies such as by Oktay and Gozgor (2013).

Across all the four models, the coefficients of the error correction terms are negative and statistically significant at 1% or 5% level. This confirms a co-integration between import demand and its determinants in each model.

Overall, the results suggest that exports of goods and services are positive long-run and short-run determinants of import demand in Models 1, 2 and 4, while they are only negative long-run determinants in Model 3. It is also found that consumer spending is a positive long-run and short-run determinant of import demand in Models 1-3. Relative import price is found to have a long-run and short-run effect only in Model 1, and have no effect in the rest of the models. Figure 1 presents the Cumulative Sum (CUSUM) and Cumulative Sum of Squares (CUSUMSQ) tests.

Figure 1: CUSUM and CUSUMSQ tests for Models1-4
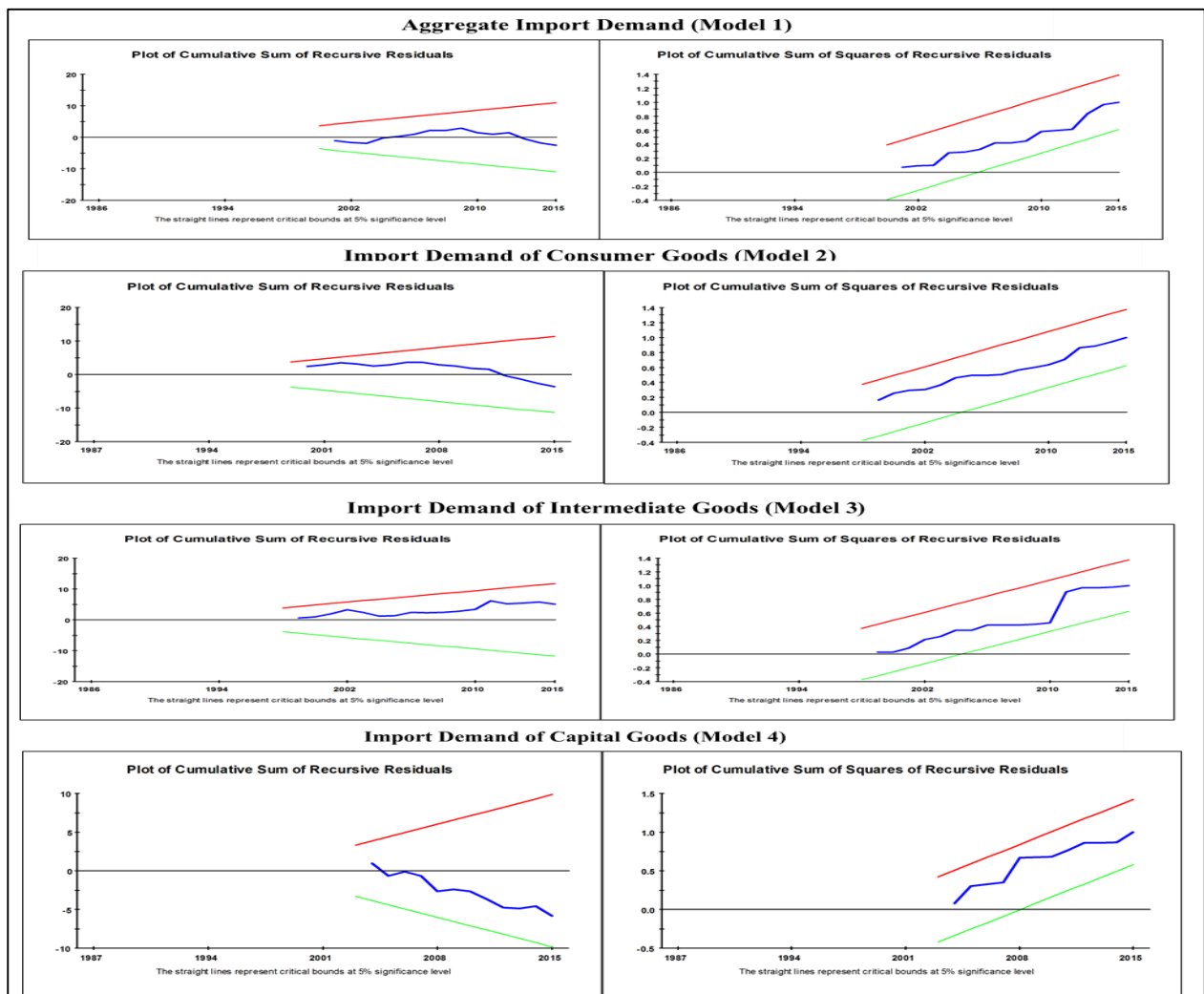
The CUSUM and CUSUMSQ results indicate that the estimated models are stable.

5. Conclusion

This study has examined the determinants of aggregate and disaggregated import demand functions in Ghana for the period from 1985 to 2015, using the autoregressive distributed lag (ARDL) approach. In the aggregated model (Model 1), aggregate import demand was the dependant variable while in the disaggregated models, major components of aggregate import demand were dependent variables. This includes import demand for consumer goods (Model 2), import demand for intermediate goods (Model 3), and import demand for capital goods (Model 4). The results for Model 1 revealed aggregate import demand is positively determined by exports of goods and services and consumer spending, but negatively determined by relative import price and trade liberalisation, both in the long run and the short run. It is also found that

government spending is a negative determinant of aggregate import demand only in the long run, while investment spending is a positive determinant only in the short run. The results for Model 2 confirm that gross national income, exports of goods and services and consumer spending are positive determinants of import demand for consumer goods both in the long run and short run. For Model 3, the results showed that government spending and consumer spending are positive determinants of import demand for intermediate goods in the long run and in the short run. It is also confirmed that exports of goods and services are negative determinants of import demand for intermediate goods only in the long run, while investment spending is a positive determinant only in the short run, respectively. The findings for Model 4 confirm that exports of goods and services is a positive determinant of import demand for capital goods, while investment spending is a negative determinant both in the long run and the short run, respectively. The results further showed that gross national income is a positive determinant only in the long run, while gross national income in the previous period and government spending in the previous period are negative determinants only in the short run. The investment spending in the previous period was found to be a positive determinant of import demand for capital goods, but only in the short run.

In sum, the empirical results for Models 1-4 generally emphasise the importance of gross national income, government spending, consumer spending and exports of goods and services either in the long run or in the short run. These variables can be used as policy indicators to predict import demand to manage import demand in different import categories in Ghana.

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