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DOI: 10.9734/JEMT/2019/44943

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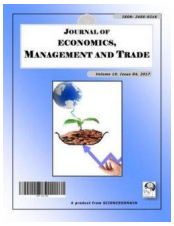
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Journal of Economics, Management and Trade

22(1): 1-17, 2019; Article no.JEMT.44943
ISSN: 2456-9216
(Past name: British Journal of Economics, Management & Trade, Past ISSN: 2278-098X)

Are the Determinants of Imports Similar Across Manufactured Products? Evidence from Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Author FO designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author EAO managed the analyses of the study. Author RSA managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JEMT/2019/44943
Editor(s):
(1) Dr. LI, Hui, Professor, School of Economics and Management, Zhejiang Normal University, China.
Reviewers:
(1) Christina Tay, Chinese Culture University, Taiwan.
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(3) Imoisi Anthony Ilegbinosa, Edo University Iyamho, Nigeria.
Complete Peer review History: http://www.sciencedomain.org/review-history/27707

Original Research Article

Received 10 September 2018
Accepted 28 November 2018
Published 08 December 2018

ABSTRACT

The study investigates the determinants of selected manufactured imports in Nigeria with a special focus on the role of domestic production. The autoregressive distributed lag (ARDL) in the context of new trade theory was utilised with data coverage between 1985 and 2016. Results show that imports of various manufactured products are affected differently by some factors. In particular, domestic output of electrical & electronics have a significant and negative effect on own imports. However, there was no significant effect of domestic production of petroleum products on imports of the same goods. Also, the effect of domestic output of food & beverages on imports of same product is positive. Further, the sensitivity of imports to exchange rate changes differ across products, in some it have immediate effect while in some it delays for a year. In the same vein, while GDP is an important driver of imports of some products, it is unimportant for some. Also, it is only food & beverages imports that significantly respond to change in tariffs. The overall conclusion from this study is that drivers of import demand differ across products.

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Keywords: Manufactured imports; manufactured output; real effective exchange rate; autoregressive distributed lag.

1. INTRODUCTION

Manufacturing sector is key to economic growth because of its dynamic nature, which provides opportunities for efficient use of resources, allows for technological breakthrough, and access to varieties of products. It also enables a country not only to be able to export and earn foreign exchange but also helps to reduce external shocks arising from factors that are outside the control of the policymakers. However, due to comparative advantage and lack of technological know –how, many countries in Africa are unable to unlock the benefit of manufacturing and this made them to depend mostly on imported manufactured products.

In the case of Nigeria, the share of manufactured output was less than 20 percent of GDP in 1981 and fell drastically to 7 percent in 2010 but rose slightly to 9 percent in 2016. In contrast to this, agriculture accounted for close to 25 percent of GDP in the recent years. This trend suggests that the structure of Nigeria output is skewed more to agriculture and mineral products than manufacturing. By implication, since domestic production of manufactured goods is minimal and declining, importation has to be carried out in order to meet local consumption.

The belief of the policymakers in the 1970s is that the share of manufacturing in total output is small because infant manufacturing firms were facing high competition with foreign products. To encourage production, import substitution industrialisation was introduced with the use of tariffs and outright ban of selected import competing products. Unfortunately, this policy was not successful because apart from the reduction in total welfare of the populace, it worsened the current account balance, led to exchange rate crisis and overall balance of payments deterioration [1]. Egwaikhide [2] has earlier pointed out that Nigeria experienced persistent decline in foreign exchange earnings specifically due to oil price slump. Thus, even during the period of import substitution industrialisation, there was no meaningful contribution of manufacturing to output.

The purpose for import substitution industrialisation in the 1970s was to reduce importation and hence import dependence, but the country experienced huge and rising imports, increasing from an average of N4.23 billion or 16.9% of GDP between 1970 to 1980, to N16.86 billion or 16.0% of GDP in 1981 and further to an average of N540.95 billion or 26.7% of GDP between 1991-2000 period. The substantial rise in import bills was attributed to the country's quest for developing the infrastructural facilities. What is worrisome in this importation is that some manufactured products for which the country enjoys comparative advantage account for a substantial share.

According to the product classification in Nigeria, there are thirteen (13) manufacturing sectors, namely oil refining, cement, food, beverage and tobacco, textile, apparel and footwear, wood and wood products, pulp, paper and paper products, chemical and pharmaceutical products, non-metallic products, plastic and rubber products, electrical and electronics, basic metal, motor vehicles & assembly, and other manufacturing. Out of these products, the most imported are the electrical & electronics, constituting 29 percent of total imports in 2010 up from 21 percent in 2000 but fell slightly to 23 percent in 2016. The second most imported product was transport and transport equipment, reduced from 21 percent in 2010 to 8 percent in 2016. Among the top ten most imported manufactured products are food & beverages, textile and clothing, and plastic rubber. A special case is importation of petroleum products that accounted for almost 30 percent of total import in 2016 but actually less than 10 percent before 2010.

Surprisingly, the products that are among the top 10 imported manufactured goods also form part of the top ten manufactured goods that are mostly produced domestically. Specifically, food & beverages accounted for 56 percent of domestic manufactured output while textile, oil refining and plastic & rubber product are correspondingly 15 percent, 5 percent, and 2 percent of total manufacture products. Domestic production of electrical & electronics and transport equipment are very low as their respective contribution to total manufactured products accounted for less than 1 percent. Thus the structure of domestic manufactured product and that of the manufactured import show that on the one hand, Nigeria import most of the products for which it has least comparative advantage, that is, electrical & electronics and on the other hand, there are products in which comparative advantage can provide more

production domestically but for which it is highly imported, that is, food & beverages. Also, oil refining that could be produced domestically constitutes less than 5 percent of domestic manufacturing output while it is almost 30 percent of total manufactured imports in the recent time.

One of the factors driving merchandise trade is the exchange rate. When measured indirectly, increase in the exchange rate should reduce importation and benefits exports. But such situation will also have implication for the capital imports that is important for the production of domestic manufactured goods. However, it is so worrisome that during the period of exchange rate depreciation, importation of these manufactured products, that is, electrical & electronics, food & beverages, and oil refining, are on the increase. For instance, controlling for relative price, when real effective exchange rate rose from 69 in 2010 to 113 in 2016, imports of manufactured products rose from $5.82 billion to $35.19 billion in 2016. However, when the focus is shifted to the structure of manufactured products, oil refining had the highest response followed by footwear and then electronics. This implies that the way exchange rate influences imports vary across products and so, it is important to investigate this varying degree of response.

One of the measures utilised to discourage importation is tariff. Although tariffs are measured based on unit of products (about six-digit product code). The World Bank documents both weighted and unweighted average tariff across product lines [3]. In the case of Nigeria, weighted average tariff on petroleum products rose from 20 percent in the 1990s to around 30 percent in early 2000s but fell to 8.3 percent in 2005 while further reduction was experienced in 2010 through 2016. During the upward tariff adjustment, petroleum product imports was on the increase left alone when it was adjusted downwards. This suggests that importation of petroleum products may not be affected by tariff. This is to be further investigated in order to see clearly whether or not tariff influences petroleum imports or not. In the case of food & beverages, there has been high tariff placed on these products particularly in the 1990s through 2000s when the weighted average tariff was between 72 percent and 97 percent. In 2002, importation of the products experienced prohibitive tariff going to 104 percent ad-valorem. However, since 2007, tariff on food & beverages were reduced to 20 percent. Hence, the role of tariff as a determinant of product imports, tend to be unclear and requires further investigation.

This study is aware of vast growing empirical works on the subject matter. Up till date, the empirical research can be decomposed into three. First is the set of papers that focus on panel data of several countries (including developed, developing and transition economies) for many years. Recent works on this set of papers include [4,5,6]. The result from such studies cannot be generalised at country-specific level. The second set comprises studies focusing on regional blocs and country-specific ([7] for Thailand; and [8] for Sierra Leone). The third set contains studies on country/regional based product-specific analysis. In this regard, [2] decomposed import demand into capital and consumer goods imports for Nigeria; [9] and [10] investigated the determinants of energy imports. However, while [9] paid attention to aggregate energy demand, [10] examined the case of non-renewable energy. Very recently, [11] investigated determinants of energy import demand in the EU. All the papers, excluding [11] employed the same estimation method, that is, the autoregressive distributed lags (ARDL) but the work of [11] paid attention to how symmetric and asymmetric information influence the response of import demand to changes in its determinants.

A version of the third set, and which is relevant to the present study is contained in the papers of [12] for China, [13] for Malaysia and [14] for the EU countries, the US and Japan. These papers also employed ARDL estimation method. From these lists of studies, none investigate the case of manufacturing products. Those that focus on manufacturing products did not examine the case of Nigeria. As noted earlier, Nigeria is a net importer of many manufactured products and so, it is important to investigate its determinants. Therefore, the first contribution of this work to the existing literature is to carry out empirical work on the determinants of manufactured imports for Nigeria with special focus on some most imported manufactured products.

Virtually all the papers investigating import demand in Nigeria use bilateral exchange rate, in this case, Naira to Dollar. While this measure is reasonable in the case of energy demand (because oil – which is the major aspect of energy in Nigeria – is sold in dollars) the same cannot be said for other products, particularly

manufactured products which most are not from the United States. Most manufactured imports come from China, Japan, Germany, and other European countries. The appropriate variable that should enter the import demand of this kind is the effective exchange rate. The effective exchange rate incorporates the exchange rates of all trading partners with respect to the share of trade of each country in total trade of the reporting economy. Thus the second contribution of this study to the existing literature is to include the real effective exchange rate, which is more encompassing than the bilateral exchange rate in the import demand model of manufactured goods. In the same vain, most empirical works on import demand, particularly in the case of Nigeria always omit the role of domestic production. Including domestic production in the import demand model will capture the competitiveness of import substituting products in the economy. If domestic products are competitive, then increase in the production should reduce importation of such product. The only study that considers domestic products in the import model is [10] where production of domestic non-renewable energy was incorporated in the import demand model. Incorporating domestic production of manufactured goods in the manufactured import demand will show whether the manufacturing base is strong enough to compete with import of same product or not.

Based on the issues raised above, this work seeks to contribute to the methodological and empirical aspect of existing literature. In the case of methodology, this study includes real effective exchange rate of domestic output. It also models import demand at product level. The research work validates empirical study and also extends the work of [10] in the import demand of Nigeria.

In order to provide succinct information based on product level, the study focuses on the analysis of selected manufactured products, namely, petroleum products, electrical and electronics and food & beverages. The basis for choosing petroleum products is due to its importance and peculiarity and also to compare the result with [10]. The inclusion of electrical & electronics was borne out of the fact that it is the most imported manufactured products, according to the trade statistics in Nigeria. Food & beverages was included because it is the most produced goods domestically. The coverage period is from 1985 to 2016 based on the accessibility of data.

2. BRIEF LITERATURE REVIEW

There is a plethora of empirical evidence on the determinants of import demand. For the sake of volume, only the recent evidence is documented. [13] empirically estimated import demand function for aggregate imports, manufactured imports and machinery for Malaysia for the period 1979 to 1992. The result shows that income and price elasticities are important determinants of import demand. The researchers also noted that import demand by the country is generally income-elastic, suggesting that as the Malaysian economy grows, demand for imports increases at a faster rate. In the same vein, price changes are a significant driver of imports in the country. It is also interesting to discover that price elasticity is elastic, suggesting that a slight decrease in relative price will more than increase demand for imports (both aggregate or disaggregate).

[14] estimated the demand for imports (and exports) of manufactured goods for a panel containing the majority of the EU countries as well as the United States and Japan. After examining the stationarity and cointegration of the series, they employed the error correction mechanism. Their result indicated that foreign direct investment (FDI) positively and significantly affected demand for manufactured imports. In case of China, [13] assessed whether the determinants of manufactured goods imports have changed over the past years. They considered domestic demand, exports and real exchange rate as explanatory variables in their industry-specific panel regressions covering 2001-2011 for 16 manufacturing industries. The result showed that exports have a positive effect on imports. In particular, a 1 percent increase in the level of exports was associated with an increase in imports of 0.25 percent. Also, domestic demand impacted positively on imports as 1 percent increase in domestic demand influenced imports level by 0.55 percent. This suggests that aggregate imports responds faster to domestic demand than exports. Further, exchange rate negatively and significantly affected manufactured imports. From the result, a 1 percent increase in exchange rate is associated with 0.97 percent reduction in imports. This suggests that imports become more expensive during depreciation to the extent that a percentage increase in depreciation will be met with almost the same percentage decrease in imports. Based on the argument that drivers of imports might vary across product stages, the

panel regression was estimated separately for imports of intermediate goods and imports of final goods (composed of consumption and capital goods). In this case, exports are more closely associated with imports of intermediate goods when compared with final goods but the impact of domestic demand reduced.

Some empirical studies have employed ARDL bounds test approach to investigate import demand functions. For example, [15] evaluated the stability of import demand function in Malaysia using the bounds test. Import demand, income, and relative price were found to be cointegrated. Their study derived long-run income and relative price elasticities of 1.5 per cent and -1.3 per cent, respectively. [16] estimated China's import demand for 1970-1999 using the bounds testing approach to cointegration. In the long run, the author found expenditure on exports having the biggest correlation with imports (0.51), followed by investment expenditure (0.40). The author concluded that the relative price variable had little impact on the demand for imports.

The application of bounds testing approach to cointegration for the import demand in Fiji was carried out by Narayan and Narayan [17] using relative prices, total consumption, investment expenditure, and export expenditure variables over the period 1970 to 2000. Their results revealed a long run cointegration relationship among the variables with import demand elasticities of 0.69 for both export and consumption expenditures and 0.38 for relative prices. Following the same approach, [18] investigated the association that may likely exist between the demand for imports and its determinants for South Korea over the period 1980-2000. Their results showed that the volume of imports, income, and relative prices are all cointegrated. The estimated long-run (short-run) elasticities of import demand with respect to income and relative price were 1.86 (0.86) and -0.2 (-0.05) respectively.

The determinants of China's energy import demand was carried out by [6]. The findings from the ARDL suggest that, in the long run, growth of industrial production and expansion of transport sectors affect China's oil imports, while domestic energy output relatively substituted importation of the product. Thus, as the Chinese economy industrialises and the automotive sector expands, China's oil imports are likely to increase. Though China's domestic oil production has a substitution effect on imports, its growth is limited due to scarce domestic reserve and high exploration costs.

The study of [5] was on the factors behind the oil import demand policy. The study implemented a principal component analysis to construct an Oil Import Vulnerability Index (OIVI) based on four factors, which are crude oil import dependency of primary energy consumption, crude oil import bill as a share of Gross Domestic Product (GDP), non-diversification of import sources, and share of oil in total energy import. The contribution of these factors to the OIVI was found to be approximately equal. While an overall deterioration in the OIVI has been observed during periods of increasing oil prices, better diversification of oil import sources has led to significant improvement.

Zhang et al. [4] estimated the long-run and short-run demand equations for imported lumber based on classical production theory using Chinese monthly data from January 2000 to December 2013 data. The bounds testing approach for co-integration was employed within an autoregressive distributed lag framework. The results showed that there exists a long-run co-integrating relationship between China's lumber import and some specific explanatory variables. In the long run, the import demand was found to be elastic with respect to the lumber import price and a macroeconomic shifter at the 5% statistical level. Imported lumber seems to be a complement to other input factors, but the effect is not statistically significant. As expected, the short-run price and income elasticities are smaller in absolute terms than their long-run counterparts.

The work of Gouvêa and Schettini [19] presented econometric estimates for the Brazilian aggregate imports over the period 1996–2010. The study explored the co-movements among total imports, gross fixed capital formation and household consumption (alternative model). The results underscore the role played by domestic income, which is the main determinant of total imports. The limited domestic supply of capital goods makes the allocation of domestic income also relevant to the imports dynamics. The out-of-sample assessment (one-step-ahead forecast) showed a good performance of the long-run vectors of the alternative models in predicting aggregate imports. However, the best performance was obtained by the error correction representations of the canonical model.

In the case of Nigeria, [20] aimed at measuring the relative strengths and nature of effects of the variables that determine Nigeria's non-oil import demand. The results was in contrast with earlier studies, as two key variables previously reported as significant (real exchange rate and real income) were insignificant. Adewuyi [10] estimated determinants of import demand for refined petroleum products in Nigeria for the period 1984–2013. The paper employs autoregressive distributed lag (ARDL) bounds test co-integration method and analysed both long-run and short-run determinants of import demand for total and specific petroleum products. In the long-run, aggregate and sectoral incomes are significant determinants of import of refined kerosene. Further, real effective exchange rate (REER), aggregate income (GDP), manufacturing sector's income, domestic energy production (DEP) and population growth rate (PGR) are significant drivers of import of refined motor spirit.

Moreover, REER, DEP and manufacturing sector's income are propellers of import of refined distillate fuel. REER and total output of petroleum products are major drivers of total import of refined petroleum products. Short-run results showed that previous period GDP, PGR and manufacturing and service sectors' incomes are determinants of import demand for refined kerosene. Further, REER, GDP, previous PGR and manufacturing sector's income exert significant effects on the import of refined motor spirit. Further, significant effects of REER, DEP, previous PGR, domestic output of the product and manufacturing and service sectors' incomes on the import demand for distillate fuel were found.

Nwogwugwu et al. [1] employed import substitution model framework to estimate the price and income elasticities of import demand in Nigeria for the period 1970 – 2013. The study used Autoregressive Distributed Lag (ARDL) bound test to study the long-run relationship between variables of interest. The estimated long-run coefficients showed that the price and income elasticities of import demand in Nigeria were about 0.03 and 0.55 respectively during the period covered and it implied that the long run import demand in Nigeria has been price-and income-inelastic since the sizes of the coefficients of real GDP and relative prices were less than unity and among the explanatory variables studied, real GDP was the main determinant of import demand in Nigeria. The results from the short-run dynamics model suggested that about 67 percent of the disequilibrium in the import demand is corrected in the current year.

Ogbonna [21] estimated the aggregate import demand function for Nigeria for the period of 1980 - 2010. Co-integration approach was implemented while the error correction term in the estimated VEC model was evaluated for long-run causal relationship. The short term coefficients were gauged for short term causal relationship between the explained and the explanatory variables. Results indicated the existence of an underlying long-run stationary steady state relationship between import demand and real exchange rates, world price index and disposable income. Real exchange rates, world commodity price index, disposable income and the structural adjustment policy, jointly significantly cause import demand in Nigeria. In the short run, real exchange rate, world commodity price index and disposable income, have no significant effect on import demand in Nigeria.

Nteegah and Nelson [22] investigated the factors influencing import demand in Nigeria over the period 1980 – 2014 using the ordinary least square (OLS) and co-integration/error correction mechanism. The result revealed that real income level, domestic price change, exchange rate all have negative and significant impact on total import demand in Nigeria while degree of openness; gross capital formation and external debt have positive and significant influence on total import demand.

Fedeseeva and Zeidan [11] claim to take a step in updating long-outdated estimates of import demand elasticities using recent data for crude oil and derive energy products and use this to contribute to the debate on the asymmetry of import demand by using recent development in econometric modeling. The model was used for the Eurozone between 1999 and 2015. Their results have important implications for the geopolitics of energy markets in Europe. (Asymmetric) Income seems to be the most relevant determinant of import demand; also, economic growth and fossil fuel consumption are correlated, even in the context of the European towards renewable energy. The result also suggests that the European economic recovery may derail the drive for lower fossil consumption and that changes in the natural gas market may further complicate this drive.

Three conclusions can be made from this review. First, factors determining import demand vary across countries. Second, the determinants of import demand is better studied at product level because there is no reason to believe that products respond uniformly to factors that determine them. Third, the outcome of the result depends on the type of estimation technique employed. Since most of the empirical works employ the autoregressive distributed lag, which is considered as the best due to its ability to predict and show both short and long run effect, the present study employs the same methodology. However, throughout the empirical review, there is no single paper that studies product level imports in Nigeria with special attention to competitiveness and real effective exchange rate. This is the gap that the present study fills.

3. THEORETICAL FRAMEWORK AND METHODOLOGY

3.1 Theoretical Framework

The theoretical framework employed for this work is the new trade theory. The justification for choosing the theory is that first, virtually all manufacturing products imported are traded in the monopolistic competitive market where each firm differentiates its products with its registered trade mark. The theory suggests that products traded can be perfect substitute or imperfect substitute. Perfect substitute implies that both exports and import products are perfect substitute, and so, consumers could choose between imports and domestic competing products because the import products are as good as the domestically produced. In the case of imperfect substitute, domestic and import products are not exactly alike. The implication of this is that the market is neither filled completely by domestic nor foreign goods when each good is produced under constant or decreasing costs. Perceived in this way, the new trade theory allows the reason why domestic products should enter the import model. If import and domestically produced products (which can be exported) are perfectly substitute, the increase in domestic demand for a particular product should have an exact decrease in the imported competing products. If the products are imperfectly substitute, insofar as they are substitute, a one-for-one effect will not be observed. An extension to the new trade theory is that domestic product and import competing counterpart could be complement so that there will be large size of the product in the domestic market.

3.2 Model Specification

Following [10], the model specification of import demand for this work stems from assuming that consumers consume two commodity bundles of which one is domestic and the other one is foreign. These two-commodity bundles are assumed to exhibit imperfect substitute. Thus, household seeks to maximise their utilities by choosing optimal commodity combination subject to budget constraint [23]. The constraints faced are the income of the household, the domestic price and the foreign price of the goods, among others. Hence, the basic import model in the context of imperfect substitute framework is specified in equation

$$M_{ity}^{d} = F(Y_t^{h}, P_t^{d}, P_t^{m}) \quad (1)$$

That is import demand at time *t* (M_{ity}^{d}) is a function of domestic nominal income (Y_t^{d}), domestic price index (P_t^{d}) and import price index (P_t^{m}). Due to possible of multicollinearity between the two prices in equation 1, and the assumption of homogeneity, the prices are expressed in relative term, that is,

$$M_{ity}^{d} = F\left(Y_t^{d}, \frac{P_t^{m}}{P_t^{d}}\right) \quad (2)$$

Equation 2 says that import demand is a function of nominal income and relative price. The relative price explains why economic agents switch demand between imports and domestic goods. Following the theoretical framework, manufactured importes are heterogeneous products. The manufactured imports considered in this study are the petroleum products, electrical & electronics, and food & beverages. Therefore, the respective model for each product is presented in equations 3 to 5.

$$M_{t,Pet}^{d} = \beta_1 + \beta_2 Y_t^{d} + \beta_3\left(\frac{P_t^{m}}{P_t^{d}}\right) \quad (3)$$

$$M_{t,elect}^{d} = \beta_1 + \beta_2 Y_t^{d} + \beta_3\left(\frac{P_t^{m}}{P_t^{d}}\right) \quad (4)$$

$$M_{t,bev}^{d} = \beta_1 + \beta_2 Y_t^{d} + \beta_3\left(\frac{P_t^{m}}{P_t^{d}}\right) \quad (5)$$

Where the respective subscripts in the import demand function is petroleum products, electrical

& electronics and food & beverages. Meanwhile, equations 3 to 5 need to be modified because it is difficult to get import price index of each product. To deal with this problem, real effective exchange rate is used. This proxy is common the literature of international trade [10]. Fortunately, the use of real effective exchange rate is consistent with the theory of purchasing power parity of exchange [5]. In recognition of the fact that the manufactured products considered in equations 3 to 5 may (and actually) have domestic counterparts, that is, import competing goods (just like the theoretical framework suggests), it is imperative to incorporate domestic output of the respective products. Further, it is important to recognise the influence of tariff in import demand. Countries impose tariff on import competing products in order to discourage or at best, reduce import demand. Replacing relative price with real effective exchange rate, including the domestic output of the respective goods and controlling for product-based tariff, yield equations 6 to 8:

$$M^{d}_{t,Pet} = \beta_1 + \beta_2 Y^{d}_{t} + \beta_3 REER_t + \beta_4 PET^{d}_{t} + \beta_5 TAR_{t,pet} + \mu_t \quad (6)$$

$$M^{d}_{t,elect} = \beta_1 + \beta_2 Y^{d}_{t} + \beta_3 REER_t + \beta_4 ELECT^{d}_{t} + \beta_5 TAR_{t,elect} + \mu_t \quad (7)$$

$$M^{d}_{t,bev} = \beta_1 + \beta_2 Y^{d}_{t} + \beta_3 REER_t + \beta_4 BEV^{d}_{t} + \beta_5 TAR_{t,bev} + \mu_t \quad (8)$$

The logarithmic transformation of equations 6 to 8 is given as follows:

$$\ln M^{d}_{t,Pet} = \beta_1 + \beta_2 \ln Y^{d}_{t} + \beta_3 \ln REER_t + \beta_4 \ln PET^{d}_{t} + \beta_5 \ln TAR_{t,pet} + \mu_t \quad (9)$$

$$\ln M^{d}_{t,elect} = \beta_1 + \beta_2 \ln Y^{d}_{t} + \beta_3 \ln REER_t + \beta_4 \ln ELECT^{d}_{t} + \beta_5 \ln TAR_{t,elect} + \mu_t \quad (10)$$

$$\ln M^{d}_{t,bev} = \beta_1 + \beta_2 \ln Y^{d}_{t} + \beta_3 \ln REER_t + \beta_4 \ln BEV^{d}_{t} + \beta_5 \ln TAR_{t,bev} + \mu_t \quad (11)$$

3.3 Technique of Estimation

Data on manufactured products cannot be accessed for a long period. As noted in the scope of study, the period for which data are available is between 1985 and 2016 (31 years). Virtually all the variables are fraught with inertia. The implication of this is that the ordinary least square (OLS) cannot be a relevant estimation method for equations 9 to 11. In place of the OLS, the autoregressive distributed lag (ARDL) bounds test cointegration approach is employed while the error correction models (ECMs) are estimated to analyse the short run determinants of import demand for total and product-level manufactured goods in Nigeria. The use of ECMs provides another very useful information to predict the future reaction of the importation of a particular product. In particular, the ECM allows the study to examine the speed of adjustment in order to know the time it takes to restore equilibrium when at least any of the determinants changes. The ARDL specification for each product and the aggregate manufactured product is presented in equations 12 to 15.

Model 1: ARDL form of import demand for petroleum products

$$\Delta \ln M^{d}_{t,Pet} = \beta_1 + \beta_2 \ln Y^{d}_{t} + \beta_3 \ln REER_t + \beta_4 \ln PET^{d}_{t} + \beta_5 \ln TAR_{t,pet} + \sum_{i=1}^{p} \alpha_1 \Delta \ln M^{d}_{t-i,petl} + \sum_{i=0}^{q} \alpha_2 \Delta \ln Y^{d}_{t-i} + \alpha_3 \sum_{i=0}^{r} \Delta \ln REER_{t-i} + \alpha_4 \sum_{i=o}^{s} \Delta \ln PET^{d}_{t-i} + \alpha_5 \sum_{i=0}^{t} \Delta \ln TAR_{t-i,pet} + \iota_t \quad (12)$$

Model 2: ARDL form of import demand for electrical & electronics products

$$\Delta \ln M^{d}_{t,elect} = \beta_1 + \beta_2 \ln Y^{d}_{t} + \beta_3 \ln REER_t + \beta_4 \ln ELECT^{d}_{t} + \beta_5 \ln TAR_{t,elect} + \sum_{i=1}^{p} \alpha_1 \Delta \ln M^{d}_{t-i,elect} + \sum_{i=0}^{q} \alpha_2 \Delta \ln Y^{d}_{t-i} + \alpha_3 \sum_{i=0}^{r} \Delta \ln REER_{t-i} + \alpha_4 \sum_{i=o}^{s} \Delta \ln ELECT^{d}_{t-i} + \alpha_5 \sum_{i=0}^{t} \Delta \ln TAR_{t-i,elect} + \iota_t \quad (13)$$

Model 3: ARDL form of import demand for Food & Beverages products

$$\Delta \ln M^d_{t,bev} = \beta_1 + \beta_2 \ln Y^d_t + \beta_3 \ln REER_t + \beta_4 \ln BEV^d_t + \beta_5 \ln TAR_{t,bev} + \sum_{i=1}^{p} \alpha_1 \Delta \ln M^d_{t-i,bev} + \sum_{i=0}^{q} \alpha_2 \Delta \ln Y^d_{t-i} + \alpha_3 \sum_{i=0}^{r} \Delta \ln REER_{t-i} + \alpha_4 \sum_{i=o}^{s} \Delta \ln BEV^d_{t-i} + \alpha_5 \sum_{i=0}^{t} \Delta \ln TAR_{t-i,bev} + \iota_t \quad (14)$$

ARDL model 4: Form of import demand for aggregate manufactured products

$$\Delta \ln M^d_{t,manuf} = \beta_1 + \beta_2 \ln Y^d_t + \beta_3 \ln REER_t + \beta_4 \ln MANUF^d_t + \beta_5 \ln TAR_{t,manuf} + \sum_{i=1}^{p} \alpha_1 \Delta \ln M^d_{t-i,manuf} + \sum_{i=0}^{q} \alpha_2 \Delta \ln Y^d_{t-i} + \alpha_3 \sum_{i=0}^{r} \Delta \ln REER_{t-i} + \alpha_4 \sum_{i=o}^{s} \Delta \ln MANUF^d_{t-i} + \alpha_5 \sum_{i=0}^{t} \Delta \ln TAR_{t-i,manuf} + \iota_t \quad (15)$$

In equation 15, MANUF represent aggregate manufactured products and TAR implies average weighted tariff across all manufactured products.

Narayan and Smyth [24] suggest that the strength of ARDL bounds test cointegration and ECM method over the traditional Engel-Granger and Johansen approaches include the avoidance of endogeneity problem, the small sample properties, ability to handle models with single order integration I(0) and I(1) or mixed order of integration. Also, the use of ARDL may not require a pre-test for unit root while it has the ability to produce both short run and long-run model estimates simultaneously.

The bounds test for cointegration is guided by two critical values. A conclusive decision about the null is made when the calculated F-statistic falls outside the critical value bounds. An inconclusive inference about the null exists when the calculated F-statistic falls within the critical value bounds. Thus, knowledge of the order of integration of the regressors in z_t is required in order to further examine the relationship in the inconclusive case. Co-integration is confirmed among z_t variables if the F-statistic exceeds the upper critical value while the null of no co-integration cannot be rejected if the F-statistic is sensitive to the lag length for each differenced variable in z_t. Once co-integration is established, estimates of the long-run coefficients can be obtained and the ECM associated with the long-run estimates can also be estimated. The optimal lag length for each of the first differenced z_t variables is chosen based on the Akaike information criterion (AIC) due to the small sample size.

4. RESULTS AND DISCUSSION

The descriptive statistics of the variables is presented in Table 1. The average growth of food & beverages imports was 9.54 while that of electrical & electronic, petroleum products, and aggregate imports were 7.37, 12.1, and 15.4 respectively. This implies that on average, petroleum products imports had the highest growth followed by electrical & electronics and then food & beverages. The average growth of domestic output of food & beverages was 2.7. The growth of domestic output of electrical & electronics was 0.9 while that of petroleum products was 1.2 and the average growth of domestic aggregate output was 2.8 during the sample period. Tariff on food & beverages had the highest average growth (3.98) followed by tariff on petroleum products (2.9) and then electrical & electronics (2.84). The growth of GDP on average was computed to be 24.9 while the growth of effective exchange rate was 4.65.

There is no evidence of dispersion in the distribution of the series since the mean value of each series was greater than the standard deviation. The implication of this is that one of the necessary conditions for utilising the ordinary least square method is fulfilled. However, not all the series are normally distributed. This is evidenced in the probability values of the Jacque-Bera that was less than 0.05 for series such as electrical & electronics imports, aggregate imports, tariff on petroleum products and the real effective exchange rate. Not fulfilling the normality condition violates condition for employing the ordinary least square technique. The implication is that these series will have to be transformed before it can be

appropriate for a technique of estimation in the context of least square.

Before proceeding to the analysis of stationarity, it is important to establish the association between various pairs of the series. This was done for two reasons. First, analysis of pairwise correlation will provide information about the association of these variables and hence show whether there is any evidence of multicolinearity or not. In the event that there is multicolinearity, the use of OLS will be avoided. Second, one of the objectives of this study is to explore into the nature of association between any pair of the variable so as to determine their degree of relationship.

The pairwise correlation matrix is presented in Table 2. Their relevant associations for the first reason is to, examine the association between any pair of independent variables in equations 11 through 14, that is, relationship between exchange rates, GDP, domestic production of aggregate, food and beverages, petroleum and electrical & electronics and the tariff imposed on the importation of the respective products. As can be verified from the Table, real effective exchange rate had weak association with virtually all the independent variables present in the models. The relationship between GDP and tariff on petroleum, tariff on electrical & electronic, and tariff on aggregate manufacturing products was negative and less than 0.9. The interpretation of this is that negative association exists between GDP and each of the tariff variables but the degree of association is not so serious that it could lead to multicolinearity. However GDP with each of the components of manufactured output was positive and very strong. This is not surprising since each of these outputs is a share of aggregate output. Tariff on food & beverage import and the domestic production of this good was negative (-0.8), while tariff on electrical & electronics and domestic production of same goods had a degree of relationship being -0.6. Further, domestic production of petroleum products and tariff imposed on the importation of the product were also negative but weak. The negative association observed in the result is consistent with expectation. That is, imposition of tariff is expected to increase import prices, thereby making imports more expensive and hence reducing import demand of such product.

The result from the association of independent variables in each of the models indicate that there was no evidence of multicolinearity and so, all these variables can appear altogether in each of the models.

To examine the second reason, attention is paid to the association between each of the dependent variables and any of the independent variables in each model. From the Table, the correlation result shows that there was a strong and positive association between manufacturing imports and GDP (0.6) and negative association between the importation of the product and domestic output (-0.7). The negative relationship between imports and GDP is consistent with the theory. That is, increase in domestic output should reduce importation of such product, while reduction in the importation of should facilitate more domestic production.

Importation of food & beverages in relation to domestic production of same product was positive and strong. This is not expected but such situation may occur when some imported products can serve as input to the domestic output. The relationship between tariff placed on food & beverages and the importation of the product was negative and strong. Further, there is a perfect relationship between GDP and food & beverage imports, suggesting that increase in GDP is associated with increase in food & beverage imports. There was a negative relationship between food & beverage imports and real effective exchange rate. This is also consistent with the theory because theoretically, real appreciation (reduction in real effective exchange rate) implies relatively cheaper imports and hence more of such goods will be imported.

Imports of electrical & electronics was also strong and positive while tariff on the product showed negative association with the importation of the product. Like it was observed in the case of food & beverages, there was a negative but weak association between imports of electrical & electronics and real effective exchange rate. A positive and very strong association was observed in the case of petroleum products imports and GDP. Also, domestic output of petroleum products was positively associated with importation of the products. The relationship between effective exchange rate and importation of petroleum product was positive but weak. Also, tariff on petroleum import had negative association with the importation of the product.

Table 1. Descriptive statistical analysis

Statistics	Beverage imports	Beverage output	Tariff on beverage	GDP	Elect imports	Elect output	Tariff on elect	Tariff on manufactures	Manufacture imports	Manufactures output	Petroleum imports	Petroleum output	Tariff on petroleum imports	LNREER
Mean	9.54	2.65	3.95	24.88	7.37	0.90	2.84	2.74	15.43	2.84	12.11	1.16	2.86	4.65
Median	8.73	2.76	4.40	24.30	6.67	0.93	3.00	2.88	15.38	2.92	11.66	1.26	3.00	4.52
Maximum	12.92	3.63	4.65	27.03	12.89	2.43	3.40	4.06	17.46	3.95	16.01	2.62	6.40	6.19
Minimum	7.72	1.39	2.86	23.48	5.26	-0.44	2.09	2.02	7.93	1.57	7.93	-1.34	1.94	3.91
Std. Dev.	1.71	0.71	0.75	1.11	1.93	0.83	0.45	0.46	2.21	0.74	2.15	1.20	0.81	0.52
Skewness	0.51	-0.40	-0.57	0.73	1.16	0.07	-0.30	0.31	-2.50	-0.27	0.18	-0.49	2.56	1.24
Kurtosis	1.68	1.96	1.39	2.14	3.80	2.20	1.54	3.34	9.28	1.95	2.51	1.98	12.60	4.17
Jarque-Bera	3.60	2.21	5.02	3.72	7.84	0.85	3.24	0.63	83.20	1.80	0.48	2.56	152.87	9.72
Probability	0.17	0.33	0.08	0.16	0.02	0.65	0.20	0.73	0.00	0.41	0.79	0.28	0.00	0.01
Sum	295.77	82.18	122.49	771.24	228.50	27.77	88.18	85.03	478.18	88.05	375.40	36.07	88.78	144.15
Sum Sq. Dev.	87.78	15.11	17.09	36.92	112.04	20.46	6.14	6.38	146.15	16.22	138.45	43.11	19.86	8.05
Observations	31	31	31	31	31	31	31	31	31	31	31	31	31	31

Table 2. Pairwise correlation matrix of the variable

	LNBEVIMP1	LNBEVOUTPUT	LNBEVTARIFF	LNGDP	LNELECMP1	LNELECTTPUT	LNELECTTARIF	LNMANTRIFF	LNMANUIMP1	LNNAOUTP	LNPETIMP1	LNPETOUTPUT	LNPETTARIF	LNREER
LNBEVIMP1	1.0													
LNBEVOUTPUT	0.8	1.0												
LNBEVTARIFF	-0.9	-0.8	1.0											
LNGDP	1.0	0.8	-0.9	1.0										
LNELECTP	0.8	0.6	-0.8	0.8	1.0									
LNELECTOUTPUT	0.9	1.0	-0.8	0.9	0.7	1.0								
LNELECTTARIF	-0.8	-0.5	0.9	-0.8	-0.7	-0.6	1.0							
LNMANTARIFF	-0.8	-0.7	0.9	-0.8	-0.6	-0.7	0.7	1.0						
LNMANUIMP1	0.6	0.7	-0.6	0.6	0.3	0.7	-0.4	-0.5	1.0					
LNNAOUTP	0.9	1.0	-0.8	0.9	0.6	1.0	-0.6	-0.7	0.7	1.0				
LNPETIMP1	0.8	0.9	-0.7	0.9	0.6	0.9	-0.5	-0.7	0.8	0.9	1.0			
LNPETOUTPUT	0.8	1.0	-0.8	0.8	0.6	1.0	-0.5	-0.7	0.6	1.0	0.8	1.0		
LNPETTARIF	-0.6	-0.4	0.6	-0.7	-0.6	-0.4	0.6	0.8	-0.3	-0.4	-0.5	-0.4	1.0	
LNREER	-0.1	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.0	0.1	-0.1	0.0	-0.2	0.1	1.0

The result from the correlation analysis suggests that first, there appear not to be any multicolinearity in any of the models. Second, degree and direction of relationship differ across products. It is interesting to discover that food & beverage imports had the strongest association with GDP even though it was the second largest product produced domestically. Petroleum product import had the second strongest degree of association with GDP while the electrical & electronics had the least degree of correlation with GDP at the product category despite being the most imported product. Further, it is surprising to observe positive, albeit different degree of association between import and domestic output of respective products. Tariff levied on the importation of each product are of varying degrees in relation to the importation of these goods. As can be observed, food & beverage had the highest degree of association with own tariff while petroleum products had the least. It follows therefore that estimating import demand at product level should provide more reliable result than at the aggregate level.

4.1 The Result of the Unit Root Test

Result of the unit root test is presented in Table 3. The Table revealed that only GDP was stationary at level while others were stationary at first difference. Since GDP appears as independent variable in each of the models, it follows that OLS cannot be used to estimate the parameters. The appropriate method is the autoregressive distributed lag (ARDL) as discussed in the methodology section.

4.2 Presentation of Results of the Determinants of Import Demand in Nigerian

Following the models specified in equations 11 to 14 and the outcome of the unit root test, Tables 4 to 7 provides the results of ARDL. The first part of Table 4 presents the cointegrating (parscimonous) result while the bottom panel is the long run result. The result from the cointegrating equation showed that contemporaneous output, 2-year lag of output and contemporaneous real effective exchange rate significantly determine aggregate manufactured import. The model converges to its long run equilibrium after 3 years with 18% per year. While contemporaneous domestic output positively influences aggregate import, 2-year lag of domestic output had negative effect. This suggests that it takes two years before domestic output could have negative and significant effect on aggregate imports. Meanwhile, real effective exchange rate had positive effect on aggregate imports, implying that depreciation leads to increase in imports. The reason for this result could be that most factor inputs for the production of manufactured output are affected by exchange rate movement and hence aggregate import.

In the long run, GDP had positive and significant effect on aggregate manufactured imports. In the short and long run, tariff has no significant effect on manufactured import even though it shows positive effect.

At the product level, factors that significantly affected electrical & electronics imports are 2-year lag of import of the products, domestic output of electrical & electronics and real effective exchange rate.

Previous import of electrical & electronics influenced current importation of the product but increase in the production of electrical & electronics reduced importation of the product. This suggests that domestic production of electrical & electronics substitute the imported one. In the same vein, lagged values of real effective exchange rate had negative effect on the importation electrical & electronic in Nigeria. The interpretation of this is that real depreciation makes imported electrical & electronics relatively more expensive and therefore, people reduce the demand for it. This result is consistent with the trend of electrical & electronic overtime because during the marked increase in real effective exchange rate in Nigeria, importation of this product fell considerably.

The model converges to its long run equilibrium state but the speed of adjustment is slow. Specifically, only 3% of the adjustment will take place per year following any shock in the system. This implies that if there is either exchange rate or domestic output shock in the electrical & electronics sector, it will take more than 32 years before the equilibrium is restored. In the long run, only GDP was found to significantly affect import demand for electrical electronics. In the case of petroleum products, 2-year and immediate period of petroleum imports are important determinants of current importation of the product. Also, current real effective exchange rate negatively influences petroleum imports but it eventually had positive effect.

Table 3. Result of the Augmented Dikkey-Fuller unit root test

Variables	At levels				At first difference				Remark
	Critical value	1%	5%	10%	Critical value	1%	5%	10%	I(1)
LOG OF FOOD AND BEV	-0.81	-3.66	-2.96	-2.62	-6.97	-2.64	-1.95	-1.61	I(1)
LOG OF TARIFF ON FOOD AND BEV	-0.81	-3.66	-2.96	-2.62	-6.97	-2.64	-1.95	-1.61	I(1)
LOG OF GDP	2.13**	-2.64	-1.95	-1.61	-5.10	-2.64	-1.95	-1.61	I(0)
LOG OF ELECT & ELECT	0.35	-2.64	-1.95	-1.61	-7.31	-2.64	-1.95	-1.61	I(1)
LOG OF TARIFF ON ELECT & ELECT	-0.75	-2.64	-1.95	-1.61	-5.43	-2.64	-1.95	-1.61	I(1)
LOG OF AGGREGATE MANUF	-0.16	-2.64	-1.95	-1.61	-5.68	-2.64	-1.95	-1.61	I(1)
LOG OF TARIFF ON AGGREGATE MANUF	-0.74	-2.64	-1.95	-1.61	-7.96	-2.64	-1.95	-1.61	I(1)
LOG OF PETROLEUM	1.16	-2.64	-1.95	-1.61	-6.97	-2.64	-1.95	-1.61	I(1)
LOG OF TARIFF ON PETROLEUM	-0.74	-2.64	-1.95	-1.61	-9.13	-2.64	-1.95	-1.61	I(1)
LOG OF REER	-1.04	-2.64	-1.95	-1.61	-4.41	-2.64	-1.95	-1.61	I(1)

Table 4. Determinants of aggregate manufactured import demand (ARDL Cointegration and Long-run form): Selected model is ARDL(2, 3, 0, 3); included observation = 28

Cointegrating form				
Variable	**Coefficient**	**Std. error**	**t-Statistic**	**Prob.**
D(LNMANUIMP1(-1))	0.198737	0.209853	0.947030	0.3713
D(LNNAOUTP)	40.114631	11.270582	3.559233	0.0074
D(LNNAOUTP(-1))	-1.317890	17.527197	-0.075191	0.9419
D(LNNAOUTP(-2))	-36.071141	15.970390	-2.258626	0.0538
D(LNMANTARIFF)	2.727859	1.961779	1.390503	0.2018
D(LNREER)	4.229032	2.002730	2.111634	0.0677
D(LNREER(-1))	-0.272961	1.074083	-0.254134	0.8058
D(LNREER(-2))	1.482553	0.841299	1.762219	0.1161
D(LNGDP)	-1.617746	1.417012	-1.141660	0.2866
D(LNGDP(-1))	-3.201472	1.795689	-1.782865	0.1125
D(LNGDP(-2))	-3.491803	1.978337	-1.765019	0.1156
CointEq(-1)	-0.186451	0.090772	-2.055643	0.0019
Cointeq = LNMANUIMP1 - (4.3619*LNNAOUTP + 2.2992*LNMANTARIFF + 1.3276*LNREER + 1.0328*LNGDP -24.3535)				
Long run coefficients				
Variable	**Coefficient**	**Std. error**	**t-Statistic**	**Prob.**
LNNAOUTP	4.361939	1.015836	4.293940	0.0026
LNMANTARIFF	2.299172	1.890449	1.216204	0.2586
LNREER	1.327575	1.009897	1.314565	0.2251
LNGDP	1.032772	1.914536	0.539437	0.6043
C	-24.353450	44.119833	-0.551984	0.5960

Table 5. Determinants of Electrical & electronics import demand (ARDL Cointegration and Long-run form): selected model is ARDL (3, 3, 3, 3, 0); included observation = 28

Cointegrating form				
Variable	**Coefficient**	**Std. error**	**t-Statistic**	**Prob.**
D(LNELECTIMP(-1))	0.446753	0.394377	1.132808	0.2946
D(LNELECTIMP(-2))	0.382848	0.201084	1.903923	0.0986
D(LNELECTOUTPUT)	-1.485530	3.112271	-0.477314	0.6477
D(LNELECTOUTPUT(-1))	-12.428255	4.351857	-2.855851	0.0245
D(LNELECTOUTPUT(-2))	8.445173	4.595203	1.837824	0.1087
D(LNELECTTTARIF)	0.391183	1.173926	0.333226	0.7487
D(LNELECTTARIF(-1))	-0.784343	1.151179	-0.681339	0.5176
D(LNELECTTTARIF(-2))	-1.603565	1.097960	-1.460494	0.1875
D(LNREER)	0.095846	0.820526	0.116811	0.9103
D(LNREER(-1))	-1.434688	0.677291	-2.118275	0.0719
D(LNREER(-2))	-0.577674	0.552124	-1.046275	0.3302
D(LNGDP)	0.875751	0.946738	0.925019	0.3857
CointEq(-1)	-0.037769	0.017431	-2.166772	0.0534
Cointeq = LNELECTIMP1 - (-6.6052*LNELECTOUTPUT + 4.8757 *LNELECTTARIF + 0.7104*LNREER + 0.8439 *LNGDP -64.9664)				
Long run coefficients				
Variable	**Coefficient**	**Std. error**	**t-Statistic**	**Prob.**
LELECTOUTPUT	-6.605211	2.869110	-2.302182	0.0548
LNLETHTARIF	4.875714	2.928118	1.665136	0.1398
LNREER	0.710370	0.850855	0.834889	0.4313
LNGDP	0.843879	0.711233	1.186501	0.2741
C	-64.966442	26.082739	-2.490783	0.0415

Table 6. Determinants of petroleum import demand (ARDL Cointegration and Long-run form): Selected model is ARDL(3, 3, 3, 3, 3, 3); included observation = 28

Cointegrating form				
Variable	**Coefficient**	**Std. error**	**t-Statistic**	**Prob.**
D(LNPETIMP1(-1))	-0.624652	0.407957	-1.531172	0.2005
D(LNPETIMP1(-2))	-0.207413	0.181412	-1.143322	0.3167
D(LNPETOUTPUT)	0.667641	1.273217	0.524373	0.6277
D(LNPETOUTPUT(-1))	-1.878973	1.019445	-1.843133	0.1391
D(LNPETOUTPUT(-2))	1.803943	1.137647	1.585679	0.1880
D(LNPETTARIF)	0.043793	0.303487	0.144299	0.8922
D(LNPETTARIF(-1))	-1.378609	0.522318	-2.639404	0.0576
D(LNPETTARIF(-2))	-1.911468	0.736026	-2.597012	0.0602
D(LNREER)	-4.777902	1.923936	-2.483399	0.0680
D(LNREER(-1))	0.276297	0.527274	0.524011	0.6280
D(LNREER(-2))	1.571756	0.774730	2.028778	0.1124
D(LNGDP)	0.381879	0.709534	0.538212	0.6190
D(LNGDP(-1))	-1.691336	1.451239	-1.165442	0.3086
D(LNGDP(-2))	1.320666	1.039292	1.270736	0.2727
CointEq(-1)	-0.332760	0.431957	-2.770355	0.0241
Cointeq = LNPETIMP1 - (8.0482*LNPETOUTPUT -15.8740*LNPETTARIF + 18.3862*LNREER + 3.1743*LNGDP -3.9140)				
Long run coefficients				
Variable	**Coefficient**	**Std. error**	**t-Statistic**	**Prob.**
LNPETOUTPUT	8.048168	6.788783	1.185510	0.3014
LNPETTARIF	-15.874000	16.583242	-0.957231	0.3927
LNREER	18.386150	18.502948	0.993688	0.3766
LNGDP	3.174266	2.089737	1.518979	0.2034
C	-3.914034	47.255264	-0.082827	0.9380

The speed of adjustment is notable since 33% of adjustment to any shock will be achieved per year, implying that unlike in the eclectically & electronics sector that take around 33 years for the full adjustment to take place, it will only take approximately two years after the current year. This difference in adjustment is one of the reasons why analysis of import demand should be carried out at the product level. The long run result shows that none of the variables significantly affect importation of petroleum product.

Table 7 presents the short and long run determinants of food & beverages import demand. The immediate lag of domestic output of the product, immediate and 2-year lag of real effective exchange rate, current and lag period of GDP are candidates.

Tariffs failed to significantly determine the importation of food & beverages, even though the system recognises its presence. Increase in the domestic production of food & beverages lead to more importation of same product. This is unexpected, but it may occur if the two products are complements. Since the products are taken at the third digit, aggregation may becloud the influence of some products that are actually complementary. Increase in real effective exchange rate, that is, real depreciation, reduces importation of food & beverages. This implies that depreciation tends to make imported food & beverages relatively more expensive and therefore consumers reduces the consumption of the product. Increase in the importation of food & beverages following increase in GDP is a clear indication that this product is a normal good.

The speed of adjustment is so high that a shock to the system will take less than 2 years before it adjusts fully. In the long run, real effective exchange rate, tariff and GDP play significant role in determining the importation of food & beverages. The continuous increase in tariff will reduce the purchase of imported food & beverages. Continuous and consistent increase in GDP will continue to positively influence importation of food & beverages. Also, continuous depreciation of real exchange rate will lead to reduction in the importation of food & beverages. Interestingly, domestic output did not significantly influence the demand for imported food & beverages.

Table 8 presents the post-estimation tests for each of the models. This diagnostic tests are important so as to ensure the validity of the choice of the method employed. Three major tests usually accompany the ARDL method. These are the Breusch-Godffrey (B-G) serial correlation used to investigate the presence/absence of serial correlation, the Breusch-Pagan-Godffrey (B-P-G) heterosk

Table 7. Determinants of food & beverage import demand (ARDL Cointegration and Long-run form): Selected model is ARDL (3, 3, 3, 3, 0); included observation = 29

Cointegrating form				
Variable	**Coefficient**	**Std. error**	**t-Statistic**	**Prob.**
D(LNBEVOUTPUT)	-0.081797	2.471035	-0.033102	0.9741
D(LNBEVOUTPUT(-1))	8.164751	3.483030	2.344152	0.0371
D(LNBEVOUTPUT(-2))	-4.174943	2.744511	-1.521197	0.1541
D(LNBEVTARIFF)	-0.442308	0.253351	-1.745831	0.1064
D(LNBEVTARIFF(-1))	0.397088	0.260177	1.526222	0.1529
D(LNREER)	-0.224456	0.274215	-0.818542	0.4290
D(LNREER(-1))	-0.777195	0.389119	-1.997318	0.0690
D(LNREER(-2))	0.663782	0.265116	2.503744	0.0277
D(LNGDP)	0.898181	0.433967	2.069697	0.0607
D(LNGDP(-1))	0.895508	0.413590	2.165207	0.0512
D(LNGDP(-2))	-0.373276	0.383917	-0.972283	0.3501
CointEq(-1)	-0.903447	0.254956	-3.543546	0.0040
Cointeq = LNBEVIMP1 - (0.4881*LNBEVOUTPUT -0.9563*LNBEVTARIFF -1.2459*LNREER + 0.6122*LNGDP + 2.5335)				
Long run coefficients				
Variable	**Coefficient**	**Std. error**	**t-Statistic**	**Prob.**
LNBEVOUTPUT	0.488093	0.319260	1.528828	0.1522
LNBEVTARIFF	-0.956333	0.305598	-3.129380	0.0087
LNREER	-1.245892	0.342193	-3.640908	0.0034
LNGDP	0.612163	0.259665	2.357514	0.0362
C	2.533494	8.028001	0.315582	0.7577

Table 8. Diagnostic tests

Tests	Statistics	Aggregate manufactured imports model	Electrical & electronics imports model	Petroleum products imports model	Food & beverage import model
BREUSCH-GODFFREY	F-STATISTICS	0.857	2.734	2.275	0.319
SERIAL CORRELATION	PROBABILITY	0.4531	0.105	0.173	0.732
BREUSCH-PAGAN	F-STATISTICS	0.486	1.264	0.567	0.969
GODFFREY HETERO	PROBABILITY	0.906	0.334	0.853	0.506
NORMALITY TEST	JARQUE-BERA	0.483	1.207	4.389	0.356
	PROBABILITY	0.785	0.546	0.111	0.837

edasticity test used to examine the presence/absence of time-dependent variance and and the Jarque-Berra normality test. The null hypothesis in each of these tests is that there is no serial correlation, no heteroskedasticity and that the series are normally distributed. The probability for each test shows that the null hypothesis could not be rejected. Consequently, the models are reliable and predicted values shown by the parameters are valid

5. CONCLUSION AND POLICY IMPLICATIONS

The study investigates the determinants of selected manufactured product imports in Nigeria. The theoretical framework utilised was the new trade theory and the method employed was the Autoregressive Distributed Lag (ARDL) for data on relevant variables spanning 31 years from 1985 to 2016. The argument, which forms the basis for this study, is that domestic output should be a determinant of product import. This argument was empirically established in the case of electrical & electronics, where domestic output of this product has negative effect on own imports. This outcome corroborates the work of Adewuyi [10] as well. However, in contrast to this study, there was no significant relationship between the domestic production of petroleum products and imports of same goods. Also, the effect of domestic output of food & beverages and imports of same product is positive. Unlike the case of electrical & electronics where contemporaneous real effective exchange rate influences imports of same product, it will take a year before such negative effect takes place in the case of food & beverages while in 2 years hence, import of that product will be affected positively. Hence it can be concluded that although real effective exchange rate is an important driver of product imports, the direction of effect differ across products.

Another very important driver of import is GDP (proxy for national income). Surprisingly, petroleum and electrical & electronics did not respond to changes in GDP. But food & beverages showed positive response. The case of food & beverages is in line with some studies

such as Çakmak et al. [25] and Englama et al. [26] while the case of the first two products are in contrast to their findings. In the same vain, food & beverages imports was significantly affected by tariffs while imports of other products did not significantly respond to tariffs. This result strengthens the fact that it is not reasonable to assume or believe that tariff have negligible effect on imports. The overall conclusion from this study therefore is that drivers of import demand differ across products. Some of these drivers are significant in some products but insignificant in some. Some of these drivers supports theoretical underpinnings and received evidence while some breaks down.

Following the results of this study, it is recommended that first, since import and domestic output of food & beverages are complements and tariff significantly influences the product, tariff on food & beverages should be revisited. This recommendation is also suitable for electrical & electronics sector. Since tariff does not drive import demand for this product, while domestic output reduces importation, producers should continue to increase production while government should provide enabling environment. Second, exchange rate has a negative impact on importation of all the products under study. This is a good sign; however, so far as factor input used to produce domestic counterpart of the imports affected by exchange rate are from abroad, depreciation could be counterproductive. What can be done in this case is for the authorities to arrange for special exchange rates for the manufacturing sectors producing products that serves as substitute for imports such as electrical & electronics.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
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