Determinants of Nigeria's Capital Goods Import Demand Elasticities

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Abstract

Import demand elasticities are important for understanding the structure of any economy and for the forecasting of economic phenomena. Existing studies show that demand for imports depends on price, income and exchange rates. The present study aims to contribute to existing works on imports, but with emphasis on capital goods. The study is important because of the critical role of capital goods in development; every economy needs a lot of capital goods to power growth. Capital goods are durable goods used in further production of goods and services. The study, which used the Pooled Least Squares analytical technique and the simple log linear formulation of the import demand equation, found that Nigeria's demand for capital goods was price inelastic. Accordingly, policy action, working through price manipulations, may not effectively influence import demand in the desired direction. Furthermore, Nigeria's capital goods expenditure had not kept pace with her income growth performance. There was evidence that less was spent on capital goods as national income increased. Finally, it was found that exchange rate deterioration had little effect on capital goods import. In other words, the depreciation of the national currency did not appear to discourage the importation of capital goods.

Keywords: Import demand, elasticity, economic growth, exchange rate, trade

JEL Classification: F43, O14, O47,

1. Introduction

Economic forecasting profits a great deal from the estimates of import demand elasticities. These elasticities facilitate our understanding of the structure of trade with other nations and the extent to which we depend on external sources of goods and services. The fact that the world has become an integrated global village makes it even more important to understand the factors that influence decisions to buy goods and services from other countries. It, therefore, becomes imperative for us not only to understand the critical role of imports in national economic life but also the underlying factors driving the demand for them.

The role of imports in economic development

The role of import trade in the economic growth of nations cannot be overemphasized. Trade is crucial to the well-being of every country, be it developed or developing. No country is truly self -sufficient in the sense of meeting all its needs within its borders. In a study of the drivers of import demand in Zambia, Cheelo (2003) observed that there is always the need for countries to augment domestic production through imports.

In addition to its role of providing inputs for the industrial sector, import trade offers other benefits to the importing nation. It is an important source of the physical capital, in the form of plant and machinery, which are needed for industrial activity. It is also through import trade that nations gain access to the goods and services they do not produce or those in the production of which they are comparatively disadvantaged. Nigeria, being a developing country, accesses many technological innovations through the import of machinery and equipment, and concomitant technical service agreements that often follow certain capital goods imports, to further promote technology transfer. Additionally, the transmission of skills, technical and managerial knowhow, which are vital to economic development, is often effected through trade.

With regard to revenues, import trade is also very important in national revenue generation efforts. Customs duties have continued to be a very important source of revenues to many countries, including Nigeria. In general, import and export trade are vital to all the economies of the world and th is is somehow reflected in the macroeconomic statistics of Nigeria, which are discussed in passing subsequently.

Import dependence, which is one of the major hindrances to economic growth in many former colonial countries, has its origin in the immediate post-independence Import Substitution Industrialization (ISI) strategy, widely adopted by the founding fathers of such countries. The legacy of this development strategy, which is still with us, is highlighted by industrial sectors that are not only shallow but also highly reliant on imported inputs. Thus, there is a situation where import substitution activity ends up fuelling more importation. According to Okongwu (1984), import substitution will always result in increased importation. This view was even further advanced by Ahmed (1983) who observed that it was mounting imports, in the face of unstable export performance, that partly explained the overall adverse external sector performance of many countries in the 1980s, especially Nigeria. Consequently, a large proportion of their foreign exchange earnings is spent on the importation of

a wide range of goods and services, including raw materials, plant s and machinery; and consumables, such as drinks, soaps, tooth paste and fruit juices. This awkward situation, according to Vogel and Wagner (2008), is the natural consequence of a flawed industrial sector with heavy dependence on imported inputs.

To understand some of the factors propelling import demand in Nigeria, it might be useful to have a look at some macroeconomic fundamentals of the country. The real sector of the Nigerian economy has undoubtedly been growing consistently, albeit, at unstable rates over the past decade and more. Although the gross domestic product (GDP) growth rate declined to 6.6 in 2 012 from the 7.3% growth rate recorded in 2011, the country's overall output has grown at an average rate of 7.5% in the past ten years. This considerable growth of output would inevitably be accompanied by rising demand for imports of all categories of goods, including capital and consumer good s. This is so because a lot of inputs to the productive activities of the country are imported. The data in table 1 summarised the economic condition of the country, especially as it relates to imports.

2. Review of Relevant Literature

The relevant literature on trade generally and import demand functions in particular begins with a review of studies focusing on the theoretical issues of trade and ends with a review of empirical work. The first part will focus generally on trade theory and the role of trade in the economic growth and development of nations. Subsequent parts examine empirical works and their findings. The entire literature review is, however, carried out with the central objective of putting the study into perspective. It was also intended to provide a background for proper understanding of the underlying theories of trade relevant to import demand study.

According to Krugman and Obstfeld (2009), the collective output of the world in terms of goods and services in 2007 was about US$50 trillion. Approximately 30.0% of this output was sold across national borders, with world trade in goods and services exceeding US$16 trillion. The world is therefore very active with countries selling much of what they produce to other countries and also buying much of what they consume from others.

The econometric estimation of import demand parameters has been the focus of considerable literature in both developing and developed countries. Such studies include Houthakker and Magee (1975), Khan (1974), Olopoenia (1991),

and Frimpong and Oteng-Abaiyie (2006). Import demand elasticity parameters are very important for planning purposes. They are especially useful in such areas as the calculation of optimal taxes, tariff reduction and their implications on trade, as well as in exchange rate policy analysis (Hong, 1999). An understanding of the import demand parameters of Nigeria will help to highlight key areas of policy action that would positively impact our understanding of the behaviour of the country's import demand.

Gains from trade

Some basic questions that are posed about international trade include: why nations trade with one another and what do they benefit from such trading? These questions have been answered as far back as 1851 in the Ricardian theory of comparative advantage, which evolved from Mercantilism. The doctrine of mercantilism was highly nationalistic and favoured anything that increased a county's stock of precious metals. It therefore favoured the regulation and planning of economic activity and viewed foreign trade with suspicion, arguing that it could lead to the dissipation of a nation's stock of gold. Therefore, trade had to be controlled and regulated. It was this environment that Adam Smith and David Ricardo emerged to condemn and confront with their own perspectives and theories of trade.

The orthodox interpretation of trade, as expounded by classical and neoclassical economists, is that foreign trade can become a force driving resource allocation and utilization in the development process. In that regard, trade could become a mechanism for efficient resource allocation and, hence, act as an engine of growth. That was why Adam Smith's model of foreign trade postulated the existence of idle resources when a country is in the state of autarky. Smith (1937) had stated that a nation would gain from trading by producing more than it needs of the goods in which it has absolute advantage and exchanging the difference for what it does not produce. Thus, resources which otherwise would have been idle are used to produce goods, which international trade 'vents' to the outside world, thereby creating new jobs and incomes and ultimately improving societal welfare (Meier, 1984). According to Romer (1994), as citizens have access to more goods and services hitherto unavailable to them before the trade, welfare gains occur. This is the absolute advantage theory of Adam Smith.

On his part, David Ricardo posited that trade should go on even if one country has absolute advantage over its counterpart on the production of all goods. According to him, what is important is comparative advantage and not

absolute advantage. Thus, countries should specialize in the production of goods in which they have comparative absolute advantage. Country A is said to have comparative advantage over B in the production of a commodity if it has a lower opportunity cost of producing the commodity than country B. It follows therefore that trade occurs because of productivity differentials among countries. This model in which trade takes place solely because of international differences in the productivity of labour is known as the Ricardian trade model. It presupposes that nations should specialize in the production of goods in which they have comparative advantage.

Both classical and neoclassical theories of trade suggest that certain gains accrue to trading nations. Such gains include both static gains arising from resource reallocation, and dynamic gains, which arise from the outward shift of the production possibility frontiers of trading countries (Cruz, 2008). The export growth that arises from this shift serves as a continuing source of growth especially where production is subject to increasing returns to scale. Trade also stimulates competition and enhances efficiency.

According to Wacziarg (2000), who analyzed the gains from trade for a number of countries, the trade policy of a country has implications for her growth and development. Using data from 57 countries and covering the period 1970 to 1989, the author found that trade policy of openness has positive effect on economic growth. The study covers the theoretical foundations of the concept of gains from trade, some of which are the international transmission of knowledge, identified by Grossman and Helpman (1991), and technological advancement. In the view of Barro and Sala-i-Martin (1997), the idea is that economies that open up to trade are better able to import advanced technologies which enhance productivity and growth.

The more traditional theories of static gains from trade involve the role of allocative efficiency, which can be achieved more easily with an open trade regime, even when factors of production are assumed to be immobile. It is a basic postulate of the theory of comparative advantage that higher levels of output will follow when countries specialize according to their relative comparative advantage. This is clearly complementary to the position of Thirlwall (2003), which is to the effect that the factors which determine the economic progress of nations belong to the study of international trade and specialization.

Hansen (1982) highlighted the key role of trade in economic development. His import-led growth hypothesis, which was applied to North Korea, concluded that a socialist state would first import capital goods so as to develop the requisite

industrial infrastructure and capacity that promote growth. This way, both import and export trades have direct bearing on growth and development. Indeed, according to Romer (1986) there is welfare gain to be made when access to a wider range of goods and services is availed to a people through international trade.

In their work on the relationship between trade and economic growth, Parikh and Stirbu (2004) studied 42 developing countries of Asia, Africa and Latin America; it used panel data to investigate the impact of trade liberalization on economic growth, the share of investment on GDP, openness and balance of payments performance and concluded that domestic economic growth is often positively related to trade liberalization.

Moreover, the traditional trade theory which postulates that export instability is harmful to economic growth in developing countries was the focus of Fosu (2001). Earlier research on this subject produced mixed results. But Fosu's work, which employed data for 33 sub-Saharan countries, found that the effect of export instability on African countries was at best weak. He also found that imports appeared to be more critical to the growth process than exports. Thus, the results showed that import rather than export instability was the key constraint to the development of these areas.

The foregoing showed that the link between international trade and growth has been of interest to economists for a long time. But one question has been whether developing countries should follow their comparative advantage or should they protect certain key industries in order to grow faster. Of course, free trade orthodoxy since Adam Smith typically suggests that international trade, which follows the law of comparative advantage, produces certain static gain for all the participants in trade. In this regard, Lee (1994) presented an endogenous growth model of an open economy in which the growth rate of income is higher when foreign capital goods are used than domestic capital goods in the production of capital stock. His paper presented new theoretical and empirical evidence showing that international trade, by providing relatively cheap foreign capital goods, increases efficiency of capital accumulation and. thus, the growth rate of income in less developed countries. The current study benefited from the works of Romer (1986), Lucas (1988) and Roubini and Sala-i-Martin (1991), which provided frameworks for an open economy rooted in endogenous growth. models. These works have the basic agreement that imports of foreign inputs are important determinants of the link between trade and growth.

In similar studies, Grossman and Helpman (1991), Rivera-Batiz and Romer (1991) and Quah and Rauch (1990) all show that international trade has the ability to increase growth by providing a wider range of intermediate inputs, which facilitate more research and development or learning -by-doing, which is an essential element in technological transformation of nations. This view coheres with the conclusion of Kruger (1983) to the effect that a reduction of capital goods imports would reduce the GDP growth rate of a country, while a reduction in intermediate goods and raw materials imports would adversely affect output and employment.

In many developing countries, the primary strategy of industrialization, especially in the early post-independence years, has been import substitution – the domestic production of consumer goods in substitution for imports. The belief was that such a process would help conserve available foreign exchange and improve their balance of payments position. This philosophy became the leading development credo in the newly independent countries of the 1960s. Import substitution industrialization comes with a number of policy actions usually aimed at protecting the local industries. A key aspect of the policy is the shielding of local industries from competition from the more mature foreign industries using the infant industry argument. Under this policy or argument, government, through tariffs and quotas, as well as other protective measures, shields local industries against the influx of manufactured goods from mature industries in advanced economies.

Functional form of import demand equation

Behind the import demand equation is the theory of individual consumption decisions, which play an important role in economic activity. Individual preferences are fundamental to consumption decisions. An understanding of how preferences affect demand, and how demand and prices interact, is vital for th e analysis of import demand.

Several empirical formulations have been adopted to analyze the relationship between imports and its determinants. This study will draw from the works of Houthakker and Magee (1969), Khan (1974), Egwaikhide (1999), Frimpong and Oteng-Abayie (2006) and Emran and Shilpi (2001), among others. These authors estimated demand elasticities for both imports and exports for a number of countries, cutting across both the developed and developing world, including those in West Africa. According to studies by Frimpong and Oteng -Abayie (2006), Bahman-Oskooee (1986), Goldstein, Mohsin and Officer (1977) and Houthakker and Magee (1969), the simplest formulation of an aggregate import demand function relates the quantity of imports demanded to relative prices (the ratio of import prices to the prices of domestic substitutes), and real income at a given period of time, *t*.

From an economic theory, the sign of the partial derivative of import with respect to income, $\partial M^d/\partial Y$, is generally expected to be positive, while the partial derivative of imports with respect to relative prices, is expected to be negative. This formulation assumes some level of substitutability (though imperfect) between imports and domestic goods; hence, it is referred to as the imperfect substitutes model.

From available literature, the most preferred form of the equation has been the log linear form, which was applied by Kreinin (1976), Khan (1974), Magee (1975), Egwaikhide (1999), and Narayan and Narayan (200 5), in their various studies. Other empirical works that have utilized the log -linear formulation of the simple import demand model are Boylan, Cuddy, and O'Murrcheartaigh (1979), Ho (2004), and Frimpong and Oteng Abayie (2006). In support of the above position, Boylan et al. (1979) noted that in specifying this simple import demand model, most researchers have adopted the log linear formulation of the equation in preference for the ordinary linear form. This functional form is flexible, amenable and adaptable to change.

Import demand studies relating to Nigeria

A review of relevant literature shows that some attempts have been made to analyze Nigeria's import demand, especially on an aggregate basis. One of the earliest attempts to estimate the elasticities of import demand for Nigeria was by Olayide (1968). He estimated the price, income and foreign exchange earning capacity elasticities of fifteen consumer goods for the period 1948 – 1964. Based on the findings, the study came to the conclusion that Nigeria's import demand was propelled by price of imports, income of the country and her foreign exchange earning capacity. The study produced a somewhat unexpected result in that the signs of price and income elasticities were respectively positive and negative in some of his estimates. This he justified by reference to the then import substitution industrialization strategy, which, by those results, he said was succeeding.

Ajayi (1975) examined the structure of Nigeria's imports during the period 1960-1970, as a contribution to a discussion of the issues relating to the advantages and disadvantages of import controls Nigeria was considering to impose. The paper set out to highlight the factors that were central to the determination of Nigeria's retained import s, defined as total gross imports adjusted for re-exports. The study was divided into two parts. The first part considered the determinants of aggregate import demand, while the second focused on factors that determine the components of total import. The model adopted was essentially the traditional import demand formulation, with alternative specifications. The work estimated several equations with the value of retained imports as dependent variable, while real income, relative prices, foreign exchange reserves and a war dummy were the independent variables. Real per capita retained imports was also used as a dependent variable after adjustments were made to the model.

The OLS method was adopted. For some classes of goods that had no published statistics of import price index, Ajayi used an appropriate technique to derive such indices.

The results obtained showed that relative prices, real per capita income and foreign exchange availability were vital determinant s of Nigeria's retained imports during the period under review. The short-run price and income elasticities were -2.7 and 0.26 respectively. The calculated price and income elasticities were -03.71 and 0.35 respectively. Based on the regression results, the work concluded that Nigeria's imports were p rice elastic and, therefore, would be affected by a policy that changes the structure of import duties.

Anusionwu (1984) carried out what is probably the first study of Nigeria's import demand focusing on capital goods. The coverage of the study was for 1960-80, and it was with a view to finding out the impacts of price, income, and exchange rate and foreign exchange earnings on the demand for capital goods. The study, which was mainly aggregative, employed the simple formulation of the import demand equation for some categories of capital goods. Attempt was, however, made to disaggregate the passenger cars component of transport equipment. Among the various categories of capital goods studied, he found that a considerable number of items were price elastic, especially agricultural machinery and implements, and telecommunication apparatus, railway vehicles, road motor vehicles and electrical power machinery, which recorded less than -2 each. But the least price elastic items were office machines and aircraft. The estimates of income elasticity showed positive signs and were significant at 5 .0 and 10.0% confidence levels except agricultural machinery and implements, railway vehicles and boats/ships. Aircraft, road motor vehicles, textile machinery and other appliances had the highest income elasticity. While most items showed positive elasticity for foreign exchange reserve, only 5 of 18 estimates were significant at 5 .0% level and 10 of them at the 10.0% level.

Ozo-Eson's (1984) used a monetary approach to investigate the role of money supply in Nigeria' s import demand. The study, which utilized the traditional import demand function, incorporated real money balances in the analysis. The results showed that relative prices and money balances significantly influenced Nigeria's demand for imports during the period, 1960 to 1979. The coefficients of real income obtained from alternative models were not significant even at the ten per cent level. It was therefore concluded that disequilibrium in the money market will directly affect total imports. Consequently, a reduction of the money supply tended to reduce aggregate import.

Olopoenia's (1991) study functionally related demand for imports to real expenditure and real exchange rate. Th e study, which drew on the new developments in cointegration and error correction literature, was also based on the monetary approach to the balance of payments, akin to what Aghevli and Sassanpour (1982) adopted. The results indicated that each of these variables not only had the expected sign but were also significant at the five per cent level.

Egwaikhide (1999) studied the determinants of import demand in Nigeria. The study examined the determinants of aggregate import and its major components in Nigeria, covering the period 1953 to 1989. The model specification drew on both the traditional and Hemphill import demand functions, while the estimation procedures took into consideration developments in time series modelling. The results obtained were very informative. Quantitative evidence indicated that short-run changes in the availability of foreign exchange earnings, relative prices and real output significantly explain ed the growth of total imports during the period under investigation. Particularly striking was the short-run impact of foreign exchange availability, which was tied to the long -run effect through a feedback mechanism. Thus, even though these variables all played an important role in sharpening import behaviour, the effect of foreign exchange availability was particularly remarkable. It follows, therefore, that to increase total imports, it is essential to implement the set of macroeconomic and sector-specific policies that can considerably relax the binding constraint on the availability of foreign exchange. Moreover, the near unity of the price elasticity of import demand suggests the high sensitivity of demand to the price of imports. In this sense, assuming neutrality of other economic policies, devaluation can reduce the demand for aggregate imports.

With respect to the components of imports, regression results obtained by the author showed that the import of raw materials responded significantly to foreign exchange earnings, relative prices and industrial output through an error correction mechanism. Thus, it is evident that in the absence of an increased domestic supply of raw materials, the growth of industrial sector is expected to raise the demand for imported raw materials. Findings also demonstrated that changes in raw material imports showed a high degree of responsiveness to trade liberalization in the period. This possibly indicated that import tariff and non-tariff measures represent important policy instruments that should be considered when designing policy packages to influence the import of raw materials.

Furthermore, the import of capital goods was found to be highly sensitive to the dynamics of relative prices; an indication that exchange rate management and

the conduct of fiscal and monetary policies that alter relative prices have important effect on imports. Investment constitutes the motor of economic expansion. Annual changes in investment needs also exerted appreciable influence on the demand for imported capital goods during the study period.

The inference that the author drew from this was that the growth of an economy tends to expand the demand for capital goods imports, especially in the absence of foreign exchange constraints and import restriction measures. Empirical estimates showed that foreign exchange constraint is one of the chief determinants of consumer goods import in Nigeria. The author suggested the need to further investigate the determinants of aggregate imports using relatively more sophisticated statistical methods. He also suggested the application of such methods developed by and Johansen and Juselius (1990). He anticipates that such methodologies may reveal other possible long-run relationships that could not be established by the Engle-Granger two-step method.

Capital goods are non-competitive imports in Nigeria, because the domestic capacity to produce them is evidently rudimentary, if at all it exists. In the second half of the seventies, an average of 43.0% of Nigeria's annual import bill was spent on capital goods (Anusionwu, 1984). However, this figure dropped to an average of 25 percent between 2006 and 2011 (Abdulwaheed, 2014). This shows that the share of capital good s in the country's overall import spending has decline over the years.

3. Theoretical Framework and Methodology

This study draws from the analytical framework of Houthakker and Magee (1969), Anusionwu (1984) and, Frimpong and Oteng-Abayie (2006), which not only used the simple import demand model but also related their works to the same environment as that of the present study. To successfully implement the theoretical framework drawn from these studies, the current study adopted the simple import demand equation identified in the literature. It is simple, adaptable and it simplifies result interpretation, particularly with the adoption of log linear formulation of the simple import demand model.

The aggregate capital goods import demand function

This function estimates an aggregate import demand model for the constituent items of capital goods imported to Nigeria under the Standard International Trade Classification (SITC). It is termed aggregate in the sense that it combines all imports of capital nature from all sources. It follows, therefore, that an aggregate capital goods import function shall be estimated for the combined capital goods imports of the country. This will enable us to establish the determinants of the country's import demand for all capital goods items broug ht into the country.

The study covers the period 1964 to 2010 and uses data collected from the National Bureau of Statistics. In particular, secondary data from the publications of the Bureau, including various issues of the Nigerian trade summary, annual abstracts of statistics, digest of statistics, economic indicators, economic and financial reviews published by the Central Bank of Nigeria, and international financial statistics published by the International Monetary Fund. Indeed, the data were subject to the usual shortcomings of statistics from most developing countries – questions of adequacy and reliability.

The implicit form of the aggregate import demand model to be estimated may be written as follows:

$$M_{it} = e^{a}(GDP_t)^{b_1}(PMT_{it})^{b_2}(CPI_t)^{b_3}(EXR_t)^{b_4}(FRE_t)^{b_5}$$
$$MT_{it} = f(GDP, PMT, CPI, EXR, FRE)... + \mu \qquad (1)$$

Where:

MT_t = Total value of imports in naira

GDP_t = GDP or national income in naira

PMT_t = Import commodity price index in year *t*

CPI_T = Consumer price index (inflation) in year *t*

FRE_t = Foreign exchange reserve in year *t*

EXR_t = Exchange rate to the US dollars in year *t*

μ_t = Stochastic error term

Expressed in log linear form, the relationship may be represented as:

$$\log(MT)_t = a + b_1\log(GDP)_t + b_2\log(PMT)_t + b_3\log(CPI)_t + b_4\log(EXR)_t$$
$$+b_5\log(FRE)_t ... + \mu_t \qquad (2)$$

a = Constant (intercept)

μ_t = Stochastic error term

b_1, b_2, b_3, b_4 and b_5 are respectively the elasticity coefficients of income, price, inflation, exchange rates and foreign reserves.

The above model specification is clearly an adaptation of the works of Olayide (1968), and Frimpong and Oteng-Abayie (2006), among others.

It is justified by the fact that these earlier works also focused on the same region (West Africa and Nigeria). But appropriate modifications were also made—for example, the current study included an autoregressive model and a lagged model in order to deal with and eliminate any likelihood of serial correlation.

In accordance with economic theory, the partial derivatives of the independent variables are expected to be as follows: b_1 and b_5 should be positive while b_2, b_3 and b_4 should be negative. Although most of the key variables in Model A (table 4.1 (A)) were significant at the 5 .0% level, the result with Durbin-Watson statistic of 0.6, which might indicate the presence of serial correlation, was not satisfactory. It could be improved upon. Furthermore, the fitted regression line, with an adjusted R^2 of 0.34, was also very poor. Since serial correlation has the capacity to negatively affect the predictions based on these estimates, the study attempted to remove this defect by estimating two other functions, namely, autoregressive model and a lagged function. Accordingly, the following autoregressive (AR) model was estimated to isolate serial correlation by rewriting equation 2 as:

$$\log(MT)_t = a + b_1 \log(GDP)_t + b_2 \log(PMT)_t + b_3 \log(CPI)_t + b_4 \log(EXR)_t + b_5 \log(FRE)_t + AR(1)... + \mu_t \quad (3)$$

The result of the autoregressive model (B) was an improvement on that of model (A). however, to further satisfy the quest for efficient estimators of the elasticities, the study ran the lagged model shown in equation 4. The output of this model was a further improvement of the result, as subsequently explained.

$$\log(MT)_{t-1} = a + b_1 \log(GDP)_{t-1} + b_2 \log(PMT)_{t-1} + b_3 \log(CPI)_{t-1} + b_4 \log(EXR)_{t-1} + b_5 \log(FRE)_{t-1}... + \mu_{t-1} \quad (4)$$

4. Presentation of Results and Analysis

Tables 4.1, 4.2 and 4.3 showed the results presented in such a way as to allow for closer examination and comparison. While the result in table 4.1 (A) was estimated at level (i.e., a simple model without any adjustments), those of tables 4.2 (B) and 4.3 (C) were respectively autoregressive (AR) and lag models, in which some values of the dependent and independent variables were lagged one period, to take out autocorrelation. This is an accepted procedure for

removing serial correlation; the advantage of using this procedure is reflected in the output in the tables under reference.

A comparison of results of the three models revealed outcomes that were fairly comparable and improvements on the level model. The study chose the lag model against the autoregressive (AR (1) model (B) for interpretation, because the statistics from this model appeared superior to those of AR(1) model. The Schwarz and Akaike criteria of both models were comparable. Even though those of AR(1) model appeared somewhat lower than those of the lag model, the difference was too small to make it a better model.

It was observed that all the coefficients in this model were significant at 5.0% and 10.0% levels. The estimate of price elasticity had the expected negative sign and was significant at the 5.0% level, indicating that rising import prices could discourage imports, depending on the strength of the elasticity. This was theoretically consistent with expectation. The income variable, GDP, though significant at 5 .0% level, returned a negative sign contrary to theoretical expectation. While this outcome did not validate earlier studies, which reported a positive relationship between national income and imports, such as Olayide (1968) and Ajayi (1978), it probably reflected a changing pattern of investment in capital goods during subsequent years. It may also have raised key questions relating to capital investment pattern in Nigeria in more recent years. Such questions include: Is Nigeria's expenditure on capital goods commensurate with its growth? Are we spending enough on reproductive capital? Have we been replacing aging equipment as we ought to? The state of public infrastructure and the manufacturing sector may give an idea of what is happening and probably give credence to this result.

The variable for exchange rate had positive signs, indicating that devaluation does not discourage capital goods import. This outcome is consistent with earlier studies on Nigeria's global import demand behaviour (Osuji, 2010). Similarly, foreign reserve holding returned the expected positive sign. This is not only theoretically consistent but intuitively plausible; since foreign reserves are usually measured in months of imports, it is a truism that higher foreign reserves would reflect in higher demand for imports, other things being equal. Both variables were significant at 5 .0% and 10.0% levels respectively. The elasticity for inflation proxied by consumer price index returned the right negative sign and was significant at the 10 % level.

5. Conclusions and Recommendations

The foregoing analyses showed that on the average, Nigeria's aggregate demand for capital goods was not sensitive to price changes. Government could, therefore hardly influence the country's capital goods import behaviour by manipulating the price of such imports because the demand for capital goods was generally inelastic. Moreover, the observed negative relationship between capital goods import and income appeared incongruent on the basis of a-priori theoretical expectation. However, the outcome reflected the reality of the Nigerian situation, as it showed that the country spent less and less on capital goods as its economy grew over the review period. This is also in tandem with the persistent decayed infrastructure base and a declining manufacturing sector, with very low capacity utilization. In this situation, it is clear that our investment in capital goods was minimal and fringe, even though the economy has been growing strong. On the basis of this reality, it is concluded that a negative relationship between income and capital goods import demand is signally plausible.

With regard to the disaggregated model, most categories of capital goods exhibited considerable insensitivity to price movements. Only very few items were responsive to price changes, with railway equipment recording the highest elasticity of price – probably an explanation for the neglect of the Nigerian railway system to the point of total collapse during the period under review. The finding showed that the demand for capital goods in Nigeria is generally inelastic. While some categories of capital goods showed evidence of price sensitivity, their responses were at best weak. It means that only drastic policy action, and not price manipulation, could significantly affect their demand.

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APPENDICES

Table 1: Selected Nigeria's macroeconomic indicators, 2001 -2012

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Real GDP Growth (%)	4.7	4.6	9.6	6.6	6.5	7.8	6.5	6.0	7.0	7.9	7.3	6.6
Inflation (end of period)	16.5	12.2	23.8	10	7.0	8.9	11.7	9.7	9.7	6.6	11.5	7.7
Exchange rate (+:de[/-:appr)	3.0	10.6	7.7	-3.1	3.9	4.0	4.8	2.3	9.3	1.4	1.4	0.0
Money supply (M2+) growth (% change)	20.8	27.9	24.1	14	17	39.9	30.7	43.4	41.3	29.3	33.9	2.9
Domestic Revenue (% of GDP)	32.4	22.2	26	34.2	17.7	17.8	31.3	24.2	26.7	25.3	25.1	26.5
Imports (% of GDP)	17.9	19.2	21.1	17.4	23.0	15.5	17.4	17.9	35.1	21.7	26.4	21.4
Exports (% of GDP)	27.1	22.4	31.3	40.3	49.5	39.3	38.1	43.8	36.2	32.9	39.6	36.7

Source: WAMI: WAMZ Macroeconomic and Convergence Report End -December, 2012.

Information f or Authors

Table 4.1 (A) Level Import Demand Model

Dependent variable: LOG(MT)
Method: Pooled Least Squares
Sample: 1964 2010
Included observations: 42
Cross-sections included: 18
Total pool (balanced) observations: 756

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	12.36358	0.633984	19.50140	0.0000
LOG(GDP)	0.594917	0.107753	5.521093	0.0000
LOG(PMT)	0.164207	0.028322	5.797917	0.0000
LOG(CPI)	-0.523157	0.072282	-7.237671	0.0000
LOG(EXR)	0.055573	0.093827	0.592293	0.5538
LOG(FRE)	0.057847	0.081092	0.713350	0.4759

R-squared	0.344457	Mean dependent var	17.93659
Adjusted R -squared	0.340087	S.D. dependent var	2.724216
S.E. of regression	2.213019	Akaike info criterion	4.434497
Sum squared resid	3673.089	Schwarz criterion	4. 471227
Log likelihood	-1670.240	Hannan -Quinn criter.	4.448645
F-statistic	78.81791	Durbin -Watson stat	0.623364
Prob(F -statistic)	0.000000		

Table 4.1 (B) Autoregressive Import Demand Model

Dependent Variable: LOG(MT)
Method: Pooled Least Squares
Date: 09/18/14 Time: 18:10
Sample (adjusted): 1965 20 10
Included observations: 41 after adjustments
Cross-sections included: 18
Total pool (balanced) observations: 738
Convergence achieved after 9 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.720549	1.605926	6.052925	0.0000
LOG(GDP)	0.591877	0.138809	4.263961	0.0000
LOG(PMT)	0.535936	0.024966	21.46683	0.0000
LOG(CPI)	-0.065708	0.072512	-0.906166	0.3651
LOG(EXR)	-0.037906	0.076578	-0.495005	0.6207
LOG(FRE)	-0.034296	0.071041	-0.482766	0.6294
AR(1)	0.839069	0.020975	40.00248	0.0000

R-squared	0.733132	Mean dependent var	17.99532
Adjusted R-squared	0.730941	S.D. dependent var	2.723025
S.E. of regression	1.412457	Akaike info criterion	3.537978
Sum squared resid	1458.369	Schwarz criterion	3.581647
Log likelihood	-1298.514	Hannan-Quinn criter.	3.554817
F-statistic	334.6966	Durbin-Watson stat	2.293126
Prob(F-statistic)	0.000000		

Table 4.2 (C): The Lag Model				
Dependent Variable: LOG(MT)				
Method: Pooled Least Sq uares				
Date: 09/18/14 Time: 08:05				
Sample (adjusted): 1965 2010				
Included observations: 41 after adjustments				
Cross-sections included: 18				
Total pool (balanced) observations: 738				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.620551	0.63971	8.786089	0
LOG(GDP)	0.874417	0.210912	4.145893	0
LOG(PMT)	0.492453	0.02657	18.53422	0
LOG(CPI)	0.002892	0.079528	0.036368	0.971
LOG(EXR)	-0.07048	0.082306	-0.856289	0.3921
LOG(FRE)	0.165807	0.097777	1.695766	0.0904
LOG(MT(-1))	0.714715	0.026411	27.06145	0
LOG(GDP(-1))	-0.97272	0.225094	-4.321397	0
LOG(PMT(-1))	-0.43993	0.027669	-15.89954	0
LOG(CPI(-1))	-0.34108	0.083232	-4.097953	0
LOG(EXR(-1))	0.270692	0.079678	3.397313	0.0007
LOG(FRE(-1))	0.102467	0.061694	1.660879	0.0972
R-squared	0.765581	Mean dependent var		17.99532
Adjusted R-square	0.756323	S.D. dependent var		2.723025
S.E. of regression	1.344184	Akaike info criterion		3.467953
Sum squared resid	1281.042	Schwarz criterion		3.648867
Log likelihood	-1250.68	Hannan-Quinn criter.		3.537716
F-statistic	82.69641	Durbin-Watson stat		2.333021
Prob(F-statistic)	0			

Table 4.3

COMPARATIVE ANALYSIS OF THE THREE AGGREGATE MODELS

	LEVEL (A)			**AUTOREGESSIVE (B)**			**LAGGED ©**		
Variable	Coeff	t-Stat	Prob	Coeff.	T-Stat	Prob	Coeff.	t-Stat	Prob
C	12.36	19.5	0.00	10.05	8.26	0.00	5.62	8.79	0.00
LOG(GDP)	0.59	5.52	0.00	0.58	4.7	0.00	-0.97	-4.32	0.00
LOG(PMT)	0.16	5.8	0.00	0.53	21.02	0.00	-0.44	-15.90	0.00
LOG(CPI)	-0.52	-7.24	0.00	-0.11	-1.63	0.10	-0.34	-4.10	0.00
LOG(EXR)	0.06	0.59	0.55	-0.03	-0.34	0.73	0.27	3.40	0.00
LOG(FRE)	0.06	0.71	0.48	-0.06	-0.72	0.47	0.1	1.66	0.10
AR(1)				0.74	29.87	0.00			
R-squard		0.34		R-Squared	0.74		R-Squared	0.8209	0.00
DURBIN-WATSON		0.62		Durbin-Watson		2.207	Durbin-Watson		2.33
AKAIKE INFO CRITERION		4.43		Akaike info Criterion		3.468	Akaike info Criterion		3.54
SCWARTZ CRITERION		4.47		Schwartz Criterion		3.619	Schwartz Criterion		3.69

Source: Author's Computation