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Foreign Exchange Reserves and Import Demand in a Developing Economy: New Evidence from Nigeria

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ABSTRACT: *The attempt in this study has been to detect the influence of foreign exchange reserves on import demand in Nigeria. With data spanning from 2000 to 2020, we estimated the long-run and short-run import demand function using 'fully modified ordinary least squares' and 'error correction model' respectively after we established that our variables were integrated of the first order and that cointegration exists. The long-run import demand function pointed out that the effect of foreign exchange reserves on import demand is positive but insignificant but such effect turned negative and significant in the short-run. Import price was also noted to put forth a negative sway on import demand with its effect being significant. Income was observed to wield a positive long-run influence on import demand while the effect of exchange rate was positive and significant in the long-run but became negative and significant in the short-run. By the elasticity coefficients, income elasticity put forth a greater influence on import demand compared to every other variable with the coefficient being greater than unity. It therefore becomes pertinent for actions toward reducing the income coefficient to less than or equal to one to be instituted. It is critical that import demand management be regarded as an aspect of an inclusive stabilization strategy. Imports should be targeted as part of this effort to compensate for shortfalls in domestic production. Furthermore, strategies that reduce government spending or raise taxes (contractionary fiscal policy) could reduce income growth which is a chief driver of import demand.*

Key words: *Elasticity, Exchange rate, Fiscal policy, J-Curve, Marshall-Learner condition, Trade balance.*
JEL Classification: *F14; F31; F41; O24.*

1. Introduction

The decision to import is influenced by diverse economic factors which ranges from the domestic income, import prices, the available foreign reserves (or external reserves) to back the import demand, the exchange rate, and an array of other variables that defines the volume of import into an economy. Importation stems from the rising globalization and international interdependence among nations (Fatukasi & Awomuse, 2011). This rising interdependence is an outcome of adherence to the rules of the World Trade Organization's (WTO) coupled with reduced protectionism in international trade, which culminates to rising import in developing economies.

The pattern of international trade could have some implications on the domestic economy. Lessons from emerging economies like China and India showcases that with trade liberalization, the countries enjoyed the benefits associated with globalization (Englama et al., 2013). However, the case of developing countries such as Nigeria is different. With globalization, industrialization would be accelerated in developing countries through the importation of capital and raw materials which could promote future exports to gain from trade.

The reasons why a nation imports products and services differ from one nation to the next: to address the needs of the populace for goods and services, to fill the production gap for things that can be produced locally but not in big quantities, and to offer raw materials for industrial use (Vacu & Odhiambo, 2020). Most notably, in accordance with the comparative advantage, nations frequently import products that cannot be produced

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effectively, while others are imported for financial reasons to increase tax income for government spending on development. However, excessive importation of goods and services through imported inflation has negative effects on macroeconomic stability. Additionally, it may lead to an unstable balance of payments and have an effect on a nation's credit rating. A drain on foreign exchange reserves and a worsening of the 'balance of payments' situation can also result from excessive importing. However, if import is investment-induced, growth is often anticipated to be boosted by import.

Imports are the source of raw resources that are unavailable locally, as well as the supply of capital goods and technology, which are essential for increasing the economy's productive capacity (Vacu & Odhiambo, 2020). Additionally, imports are a component of cross-border trade, which gives nations – particularly impoverished ones and those with limited production capacity – access to capital goods produced in wealthier nations, expanding prospects for people by raising their standard of living (Mutreja and Ravikumar, 2014; cited in Vacu and Odhiambo (2020)). Still, there is a disparate viewpoint that contends that a nation's balance of payments is negatively impacted by excessive import demand. They support import substitution and fair trade because they think that free trade, particularly in developing nations, may be detrimental to economic progress (Chani *et al*., 2011; cited in Vacu and Odhiambo (2020)).

The situation in Nigeria is a case of rising importation which is not balanced with rising exports, causing balance of payments anomalies. Imports in Nigeria rose from ₦985,022.39 million in 2000 to ₦10,186,684.82 million in 2010 before reaching ₦14,893,334.49 million and ₦21,905,499.46 million in 2018 and 2020 respectively. This lead to recent unfavourable balance of payments of ₦2,219,548.48 million naira in 2015; ₦895,232.74 million in 2016; ₦636,849.97 million in 2019; and ₦8,168,415.84 million in 2020 (Central Bank of Nigeria, 2020). Given this scenario, the need to determine the import demand function for Nigeria as a result of the rising import bills becomes pertinent in order to coin policies that will aid in addressing the balance of payments issues.

The import demand of a nation depends strategically on the level of external reserves which is a crucial policy variable for maintenance of exchange rate stability in an economy operating fixed or somewhat flexible exchange rates. Therefore, the formulation and assessment of present and future macro policies targeted at attaining the trade balance heavily relies on external reserves. External reserves have an impact on trade policies from a policy standpoint. Policies that are not much restraining are linked to strong external reserves. Foreign currency is sometimes a crucial necessity in international trade to fund imports of products and services. Hearsay evidence shows that external reserves operate as a global liquidity restriction in this respect, and any rise in reserves should likely pose a favourable effect on import demand (Arize & Malindretos, 2012).

Aside from exchange rate stability, foreign reserves are widely regarded as an indicator of an economy's vigour, predominantly its exporting industries. In global trade, foreign currency is frequently required to finance imports of commodities. In this sense, foreign reserves serve as an international liquidity constraint, and any increase in reserves should boost import demand (Arize & Osang, 2007). This position is one of the hypotheses that will be empirically tested using recent Nigerian data.

The foreign exchange reserves in Nigeria has been showcasing series of fluctuations which could also affect its adequacy in financing imports, and also points to the deteriorating foreign exchange earnings from exports. As at 2002, the foreign exchange reserves grew by 13.19% as it rose from US$7,590.77 million in 2000 to US$8,592.01 million in 2002; though this is far below the 35.39% recorded in 2001 where the foreign exchange reserves were valued at US$10,277.49 million. The rising trend in foreign exchange reserves was steadily maintained that the value was more than doubled as it rose from US$24,320.78 million in 2005 to US$58,472.88 million in 2008 representing a 140.43% growth. Subsequent years were marked with drastic decline in the foreign exchange reserves as it plunged to US$32,580.28 million in 2011 or 44.28% decline. Though an improvement was later recorded as at 2013 where it was valued at US$45,612.95 million or 40% increase, such was followed by declining trend to the tune of US$26,054.37 million in 2016. Within 2017 and 2019, foreign exchange reserves rose substantially to US$ 42,249.06 or 31.10% growth before it plummets by 15.29% to US$35,791.14 in 2020 (Central Bank of Nigeria, 2020).

The classic import demand theory is grounded on the consumer theory of demand, which holds that "the customer's goal is to maximize satisfaction" (Alam & Ahmed, 2010). This argument is expanded to include consumer demand for imports, showing that consumer demand for imports is impacted by income, import prices, and the prices of other goods (Englama et al., 2013). The economy's total import demand is the sum of each individual consumer's desire for imports (Harrod & Hague, 1963). Along with the 'imperfect substitution'

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theory, which is in line with standard demand theory, the customer is predicated to maximize utility while under financial constraints. In other words, the price of the imported item, the price of locally produced goods, and the income of the importing country are all represented by the import demand function (Goldstein & Khan, 1985).

The amount of imports has typically been correlated with real domestic income and relative import prices according to empirical assessment of the import-demand function (see Thursby and Thursby (1984); Arize and Afifi (1987); Gafar (1995); Masih and Masih (2000) and Chen (2008)). In accordance with the literature, we thus incorporate a measure of domestic income as well as the relative cost of imports to our empirical model along with our foreign exchange reserve holdings. External reserves have been noted as an additional factor affecting 'import demand' in some studies (see (Arize, Malindretos, & Grivoyannis, 2004; Arize & Osang, 2007; Butts & Mitchell, 2012; Englama et al., 2013; Sultan, 2011)). Therefore, leaving out exchange reserves might cause a model's empirical results to overstate the sway of the variables that are included, especially income and import prices (Arize & Malindretos, 2012). Our concern is therefore to examine the sway of income, import prices, foreign exchange reserves, and exchange rate as it affects import demand in Nigeria.

2. Review of Related Literature and Stylized Facts

2.1. Literature Review

The neoclassical comparative advantage theory (Heckscher-Ohlin), the Keynesian trade multiplier, and the new trade theory are some of the several models of international trade that are discussed in contemporary trade theories (imperfect competition theory). The Heckscher Ohlin (H-O) framework, a neoclassical 'comparative advantage' theory, was based on the writings of Ricardo (1817). The hypothesis is predicated on the idea that since nations differ in their endowments of production components, they have a propensity to import items with low factor endowments. Thus, changes in the relative pricing of these endowed elements have an impact on global commerce (Englama et al., 2013). In other words, the idea contends that import demand is also influenced by how much more expensive a certain item is produced in the importing nation than in its trading partner. The impact of relative import prices on the volume and direction of international commerce are the comparative advantage's main concern (Shuaibu & Fatai, 2014) cited in Vacu and Odhiambo (2020)).

The Keynesian trade multiplier hypothesis assumes employment to be a variable and that global capital flows would adapt as needed by the trade balance, while seeing import demand as a function of production and price (Englama et al., 2013). The marginal income inclination to import should be one, according to the Keynesian paradigm, which focuses on the aggregate short-run link between income and import demand. The theory of 'comparative advantage' does not adequately explain intra-industry trade by taking into account market imperfections, hence the new trade theory (imperfect competition) concentrates on this area. "The implications of 'economies of scale', 'product differentiation', and 'imperfect competition' on global commerce are explained by the new trade theory" (Hong, 1999).

Empirical studies on the import demand function has been reported by different scholars in different regions. (Arize et al., 2004) took the case of a developing economy to estimate the import demand for Pakistan with the aid of a cointegration technique. A linear connection was reported to bind import demand, foreign reserves, income, and exchange rate. The short-run estimates portrayed that while income, domestic prices, and foreign reserves put forth a positive weight on Pakistan's import demand, the import prices wielded a positive influence which is also significant.

Arize and Osang (2007) in estimating the import demand for countries in Latin America (Trinidad, Brazil, Costa Rica, Colombia, Ecuador, Venezuela, and Argentina) in the short-run and long-run put to use, the error correction model and fully modified ordinary least squares (FMOLS) approaches. Findings of the study portrayed that for all the countries, a significant weight of real income, domestic prices, and foreign exchange reserves were reported in the long-run; where the influence of real income and foreign exchange reserves were positive, while that of relative prices was negative. In the short-run, foreign exchange reserves put forth a positive but insignificant weigh on import demand in all the countries; while the influence of income was positive though insignificant in some of the countries.

From 1960 to 2006, Agbola (2009) evaluated short-run cum long-run Philippines' import demand functions. As explanatory variables in the calculated model, private consumption, investment, government spending, export of goods and services, and import price index were included. The study used Johansen's co-integration

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technique to investigate this, and the outcomes showed a long-term cointegrating rapport concerning import demand and these variables.

Using a bounds testing technique, Babatunde and Egwaikhide (2010) examined the import demand function for Nigeria for 1980 through 2006. Aggregate imports, domestic income, and comparative prices were demonstrated to be cointegrated, and the predicted import demand long-run elasticities pertaining to domestic income and comparative prices were respectively 2.48 and -0.133. The findings indicated that, given Nigeria's import price elasticity being lower-than-unity, the 'Marshall-Lerner' requirements were not met.

Fatukasi and Awomuse (2011) attempted to explore the determinants of import demand from 1970 through 2008 for Nigeria. With the use of the error correction model, it was realized that core short-run determinant of import demand is the real gross domestic product, GDP, (income). The long-run result also pointed that income remains the core determinant of import demand as it put forth a positive sway on import demand, of which such effect was significant. For the short-run result, foreign exchange reserves put forth a negative effect while the influence of income remained positive, with the effect remaining significant in both cases.

Zhou and Dube (2011) calculated the import demand function for Brazil, China, India, and South Africa from 1970 to 2007 using the bounds test for co-integration technique and four distinct models. The findings exposed that, in the long term, import demand is extremely sensitive and elastic to vicissitudes in income for all four nations and specified models. Furthermore, a positive but inconsequential rapport concerning import demand and relative import price was discovered. This means that import demand in these nations is not very sensitive to vagaries in relative import prices. The findings on import demand contradicted traditional theory, which states that there is an inverse link concerning relative import prices and import demand.

Using data from the years 1970 to 2008, Fatukasi and Awomuse (2011) evaluated the factors inducing Nigeria's import demand functions. The investigation, which used an error correction model technique, showed that real income was the main short-term predictor of import demand in Nigeria. The considerable functioning of the error correction model further demonstrated the presence of a long-term link concerning the variables.

Butts and Mitchell (2012) differ from other studies by incorporating official development assistance and exports as- capacity to import ratio on the import demand function for Guyana within the framework of vector autoregression (VAR). With income growth and growth in foreign reserves exerting a positive though insignificant influence, the exports as- capacity to import ratio and official development assistance wielded a positive and significant weight on import demand; while the effect of exchange rate was negative and insignificant.

Fukumoto (2012) calculated China's disaggregated 'import demand' functions for 'capital goods', 'intermediate goods', and 'final consumer products' from 1988 through 2005. The bounds test was put forth to estimate this, and the study identified 'import demand' for these groupings of commodities as a function of GDP, income after tax, total consumption, total investment, and total exports. The data revealed that GDP and total investment impact 'import demand' for capital goods, whereas exports influence 'import demand' for intermediate products and GDP influences 'import demand' for consumer items.

For Arize and Malindretos (2012) the need to study how foreign exchange reserve affects import demand was conduction for Asian countries of India, Japan, Korea, Singapore and Thailand. The cointegration, error correction mechanism, and fully modified OLS along with the Dynamic OLS was utilized basing the major analysis of the autoregressive distributed lag (ARDL) framework. The study reported an existence of cointegrating relationship concerning the variables, while it was also uncovered that for all the countries, real income and foreign exchange reserves wielded a positive weight on import demand while relative prices put forth a negative influence. In all cases, the variables wielded a significant weight on the demand for import in the Asian countries.

Englama et al. (2013) put to use the ARDL approach in the estimation of import demand for Nigeria by using data that covers 1970 through 2011. The outcome of the analysis revealed that the identified determinants (foreign reserves, domestic consumer prices, income and exchange rate) all wielded a significant weight on import demand. The short-run result pointed out that import demand in Nigeria is both income and price elastic, revealing the possibility of an upsurge in import if the income and domestic prices surges. While foreign reserves, income and domestic prices wielded a positive influence, exchange rate put forth a negative weight in the short-run, all of which were significant.

Jiranyakul (2013) used the bounds test to probe the sway of 'real exchange rate uncertainty' on Thailand's 'import demand' from 1997(July) to 2011(December). Real income and real exchange uncertainty were the

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'independent variables' in the model. The findings demonstrated that income and 'exchange rate uncertainty' had an effect on 'import demand', with 'exchange rate uncertainty' posing a detrimental impact on Thailand's imports.

Budha (2014) investigated the impact of spending components on Nepal's Indian imports. The research also used the bounds test on yearly data from 1975 through 2011. As possible factors of 'import demand', the estimated model comprised private spending, government spending, investment spending, and export spending, plus relative import price and trade liberalisation policy. Private consumption was shown to be a primary predictor of Nepal's 'import demand' from India, whereas public spending had no significant sway. Surprisingly, investment and export spending were discovered to have a negative inspiration on Nepal's imports from India, although relative import price and trade liberalisation appear to be favourably associated to 'import demand'.

Baek (2015) used the bounds test to examine Korea's import demand behaviour from 1989(first quarter) to 2014(second quarter). The findings supported a long-run link concerning imports and income, plus relative import prices. Furthermore, income was discovered to be the most vital element for Korea's imports in both the short and long term, whilst prices only had a major short-run influence.

It is clear from the literature reviewed that recent studies have not been conducted to ascertain the import demand; and majority of the studies has been conducted in other countries, thus creating a paucity of empirical studies in the case of Nigeria. It is within this angle that this study tries to fill this gap by contributing to the existing body of knowledge using recent data.

2.2. Stylized Facts on Import Demand and Exchange Rate Utilization

2.2.1. Import Demand in Nigeria

The import demand is being segmented into the oil import and the non-oil imports Table 1. The oil import volume of Nigeria has maintained a tremendous rising trend in the 21st century with an increase from ₦220,817.69 million in 2000 to ₦237,106.83 million in 2001 or 7.38%. A further increase of 10.29% between 2002 and 2003 where oil import demand rose from ₦361,710.00 million to ₦398,922.31 million in the respective two periods; but plummet by20.26 % between 2003 and 2004 as oil import demand declined from ₦398,922.31 to ₦318,114.72 for the two era respectively. A momentous improvement was recorded between 2004 and 2005 after the decline as oil import demand rose by 150.63% from ₦318,114.72 million to ₦797,298.94 million for the respective years. The rising trend kept rolling throughout 2006 to 2012 where oil import demand was valued at ₦3,049,352.59 million representing a 99.83% upsurge between 2010 and 2012. This was accompanied by a drastic decline to the tune of 78.22% as oil import demand declined to ₦1,711,002.84 as at 2015. Meanwhile, a substantial 45.37% increase was recorded thereafter as at 2017 before a substantial decline to 28.49% was recorded as at 2020 due to the Covid-19 pandemic.

Non-oil imports portray a substantial increase more than that of the oil component as it increased from ₦764,204.70 million in 2000 to ₦2,003,557.39 million in 2005. Such trend permeates through 2011 where non-oil import demand was valued at ₦7,159,084.19 million and grew by 22.82% before declining by 16.32% as its value declined to ₦5,990,406.37 million in 2012. Subsequent years were marked by rapid increase in non-oil imports up to ₦8,558,499.88 million in 2015 before declining to ₦6,640,556.92 million in 2016 or a 22.41% decrease. The periods 2017 through 2020 was marked with a significant upsurge in non-oil import demand up to the tune of ₦19,077,608.60 million in 2019 or % growth before a 0.83% decline to a tune of ₦18,920,076.09 million in 2020.

Total import demand exhibited similar behaviours that were put forth by the oil and non-oil components over the years. The import demand rose from ₦985,022.39 million in 2000 or 33.61% of total trade and 11.64% of GDP to 2,800,856.33 million or 27.88% of total trade and 26.18% of GDP as at 2005; with a further increase to ₦5,248,556.16 million or 32.71% of total trade and 34.64% of GDP in 2008. This rising trend continued till 2011 where the value of import was put at ₦10,186,684.82 million with a 34.45% year-on-year growth rate, and accounting for 39.02% of total trade and 45.4% of GDP, before it plummets to ₦9,025,250.99 million or -12.12% in 2016 with a 48.89% of total trade and 27.18% of GDP. Import demand in subsequent three consecutive years was marked by a momentous increase to a tune of ₦23,252,475.98 million and being 48.78% of total trade and 66.78% of GDP, before it reached a low turn-out as at 2020 where it was valued at ₦21,905,499.46 million (a 5.79% decline) and accounting for 61.46% of total trade and 50.91% of GDP in 2020.

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Table 1. Import trade: Oil and non-oil (₦' Million).

Year	Oil Import	Non-Oil Import	Total Import	% of Total Trade	% of GDP
2000	220,817.69	764,204.70	985,022.39	33.61	11.64
2001	237,106.83	1,121,073.50	1,358,180.33	42.1	12.1
2002	361,710.00	1,150,985.33	1,512,695.33	46.45	10.59
2003	398,922.31	1,681,312.96	2,080,235.27	40.25	15.66
2004	318,114.72	1,668,930.55	1,987,045.27	30.15	18.28
2005	797,298.94	2,003,557.39	2,800,856.33	27.88	26.18
2006	710,683.00	2,397,836.32	3,108,519.32	29.79	25.63
2007	768,226.84	3,143,725.79	3,911,952.63	32.01	28.17
2008	1,319,460.97	3,929,095.19	5,248,556.16	32.71	34.64
2009	1,063,557.89	4,039,040.16	5,102,598.05	36.36	28.04
2010	1,748,062.20	5,828,831.34	7,576,893.54	37.74	36.76
2011	3,027,600.63	7,159,084.19	10,186,684.82	39.02	45.4
2012	3,049,352.59	5,990,406.37	9,039,758.96	36.48	41.35
2013	2,417,368.14	6,347,245.93	8,764,614.07	35.66	38.88
2014	2,213,233.95	7,540,618.93	9,753,852.88	41.65	34.87
2015	1,711,002.84	8,558,499.88	10,269,502.72	51.81	28.72
2016	2,384,694.07	6,640,556.92	9,025,250.99	48.89	27.18
2017	3,132,106.08	8,938,307.67	12,070,413.75	40.66	43.35
2018	4,368,200.30	10,525,134.19	14,893,334.49	39.1	54.58
2019	4,174,867.38	19,077,608.60	23,252,475.98	48.78	66.78
2020	2,985,423.37	18,920,076.09	21,905,499.46	61.46	50.91

Source: *Central Bank of Nigeria (2020).*

With the rising import demand discussed above with some periods of declining import demand, the import value and import volume index has been moving in similar direction as portrayed in Figure 1.

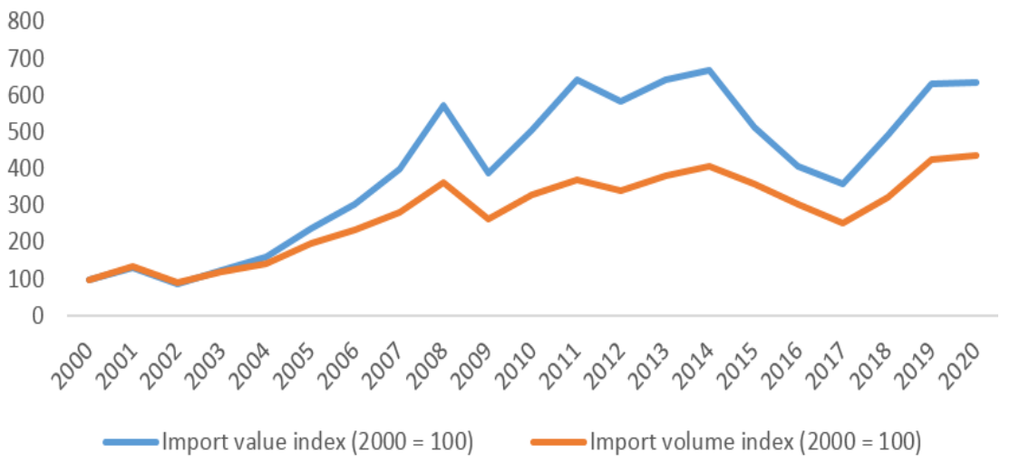


Figure 1. Import value and import volume index, 2000 to 2020.

With 2000 being the base year, the import value index rose from 132.85 in 2001237.97 in 2005; while the import volume index was 136.33 in 2001 before clicking 197.20 in 2005, thus showing the rising value and volume of import in Nigeria. This was followed by a continuous increase up to 572.74 for import value index and 362.86 for import volume index in 2008 before it dropped to 388.78 and 264.67 for the respective indices in 2009. An amplification in the import demand subsequently caused the import value and import price indices to surge further reaching 668.48 and 406.10 respectively as at 2014 before a declining was prevailing up to 358.58 and 253.54 respectively as at 2017. The two indices recovered substantially throughout the remaining periods as it reached 635.11 for import value index and 437.51 for import volume index as at.

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2.3. Sectoral Utilization of Foreign Exchange in Nigeria

The utilization of foreign exchange in Nigeria is categorized into the import and invisible components (Central Bank of Nigeria, 2020). The import components include utilization in agricultural sector, industrial sector, finished goods, transport, personal effects, oil sector, and the mineral sector; while the invisible components include education services, business service, communication services, construction and related engineering services, distribution services, environmental services, financial services, health related and social services, recreational, cultural, and sporting services, transport services, and other services. Table 2 captures the sectorial utilization for 2000 to 2007 while Table 3 captures for 2008 to 2020.

Table 2. Sectoral utilization of foreign exchange for transactions valid for foreign exchange (US$'Million), 2000 – 2007.

Year	Industrial Sector	Agricultural Sector	Finished Goods	Transport	Personal Effects	Total Visible Imports	% of Total	Invisibles	% of Total
2000	3,078.96	194.21	2,442.25	356.12	0.48	6,072.02	77.49	1,764.22	22.51
2001	4,388.22	185.00	2,818.15	533.29	0.02	7,924.67	69.81	3,426.81	30.19
2002	4,149.12	178.30	3,334.66	456.28	0.00	8,118.35	79.35	2,112.67	20.65
2003	4,836.84	106.80	3,920.17	876.30	0.45	9,740.56	80.46	2,364.87	19.54
2004	4,841.19	121.29	4,270.50	948.01	14.25	10,195.24	83.92	1,953.23	16.08
2005	6,928.11	116.24	4,218.40	1,503.96	2.20	12,768.90	85.90	2,096.23	14.10
2006	7,814.93	169.79	5,704.03	828.76	1.88	14,519.39	77.73	4,159.54	22.27
2007	9,454.97	209.37	7,720.97	1,288.80	0.13	18,674.24	68.99	8,394.01	31.01

Source: *Central Bank of Nigeria (2020).*

As indicated in Table 2, the industrial sector account for a huge proportion of foreign exchange utilization as it accounts for 50.71% of the total foreign exchange utilization for import as at 2000 and this is followed by the finished goods components with 40.22% in the same year. Both components seem to exhibit a rising trend in the utilization of foreign exchange up to 50.63% for industrial sector and 41.35% for the finished goods categories. The utilization of foreign exchange for the visible import component has showcased a declining trend as the percentage of foreign exchange utilization for total visible import declined from 77.49% in 2000 to 68.99% in 2007.

The invisible component seems to oscillate for some periods as it rose from 22.51% in 2000 to 30.19% in 2001 before declining sharply to 19.54% and 14.10% in 2003 and 2005 respectively; but a significant upsurge to 31.01% was recorded in 2007. The foreign exchange utilization for visible imports thus rose form US$6,072.02 million in 2000 to US$9,740.56 million in 2003 before reaching a substantial value of US$18,674.24 million in 2007. The utilization for the invisible components also tend rose form US$1,764.22 million in 2000 to US$3,426.81 in 2001 before declining substantially to US$1,953.23 million in 2004. Thereof, a substantial increase was recorded from US$2,096.23 million in 2005 to US$8,394.01 in 2007.

The rising trend in the foreign exchange utilization for imports still point to the fact that the industrial sector and food and manufactured products accounts for a greater chunk of the foreign exchange utilization with some inspirations from minerals/oil sectors in some periods. While the industrial sector accounts for 34.90% which is a decline from previous periods, the contribution of food and manufactured products accounted for 35.77% while the minerals/oil sectors accounted for 22.47% as at 2008. A common trend that can be observed is that the industrial sector utilization kept on declining from US$10,155.33 million in 2014 to US$6,972.14 million in 2017 before it plummets to US$5,224.90 million in 2020. This similar trend is observed in both the food and manufactured products as well as for the minerals/oil sectors. The reason behind this is the rising utilization of foreign exchange for the invisible components of imports.

The percentage of foreign exchange utilization for imports declined continuously from 62.39% in 2008 to 51.84% in 2013 and then plummet to 38.40% in 2018 before recording mild improvement to 42.61% in 2020. The invisible component is gaining momentum as it declined from 37.61% in 2008 to 31.60% in 2012 before improvements to a tune of 48.17% was recorded in 2014. A decline to 31.50% was recorded in 2016 before a massive recovery was recorded to a tune of 63.97% in 2019 before it plummet to 57.39% in 2020. A unique trend that can be observed is that the utilization of foreign reserves for visible imports has declined significantly in recent times while the invisible components gained momentum.

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Table 3. Sectoral utilization of foreign exchange for transactions valid for foreign exchange (US$' Million), 2008 – 2020.

Year	Industrial Sector	Food and Manufactured Products	Transport Sector	Agricultural Sector	Minerals/ Oil Sectors	Total Visible Imports	% of Total	Invisibles	% of Total
2008	10,552.51	10,784.92	1,672.06	364.04	6,775.28	30,148.79	62.39	18,176.66	37.61
2009	7,378.09	9,461.31	1,564.06	271.72	5,085.86	23,761.04	72.89	8,835.37	27.11
2010	6,174.06	9,662.24	1,471.88	314.23	6,202.56	23,824.98	71.39	9,545.88	28.61
2011	7,586.89	9,880.84	1,768.58	353.21	12,323.23	31,912.75	67.59	15,304.30	32.41
2012	7,576.75	10,152.67	1,818.97	241.84	8,989.47	28,779.71	68.4	13,294.99	31.6
2013	8,447.38	9,264.10	1,539.04	297.76	8,550.78	28,099.06	51.84	26,106.13	48.16
2014	10,155.33	10,465.18	1,988.44	513.63	11,079.41	34,201.99	51.83	31,788.39	48.17
2015	7,850.70	7,314.78	912.45	270.53	8,369.84	24,718.30	57.52	18,251.93	42.48
2016	5,876.39	4,588.45	530.38	254.45	5,904.50	17,154.17	68.5	7,888.63	31.5
2017	6,972.14	3,739.52	406.76	298.97	3,744.12	15,161.51	54.85	12,480.96	45.15
2018	7,383.44	5,626.88	472.59	296.32	2,102.34	15,881.57	38.4	25,479.94	61.6
2019	7,918.24	5,741.68	679.84	300.00	2,553.10	17,192.86	36.03	30,524.73	63.97
2020	5,224.90	4,468.84	512.98	188.14	1,475.58	11,870.44	42.61	15,991.16	57.39

Source: *Central Bank of Nigeria (2020).*

The relationship between the movements in the external reserves and import demand is displayed in Figure 2. The foreign exchange reserve was put at US$7,590.77 million in 2000 but rose by 58.91% to US$12,062.75 million in 2004; while triple to US$37,355.70 million in 2010. Though it declined by 12.78% to US$32,580.28 million in 2011, subsequent periods were marked by a rising trend up to US$45,612.95 million in 2013. Between 2014 and 2016, the foreign exchange reserve decline massively up to US$26,054.37 million in 2017 before surging to US$44,525.07 million in 2018 which was followed by a declining trend to a tune of US$35,791.14 million in 2020.

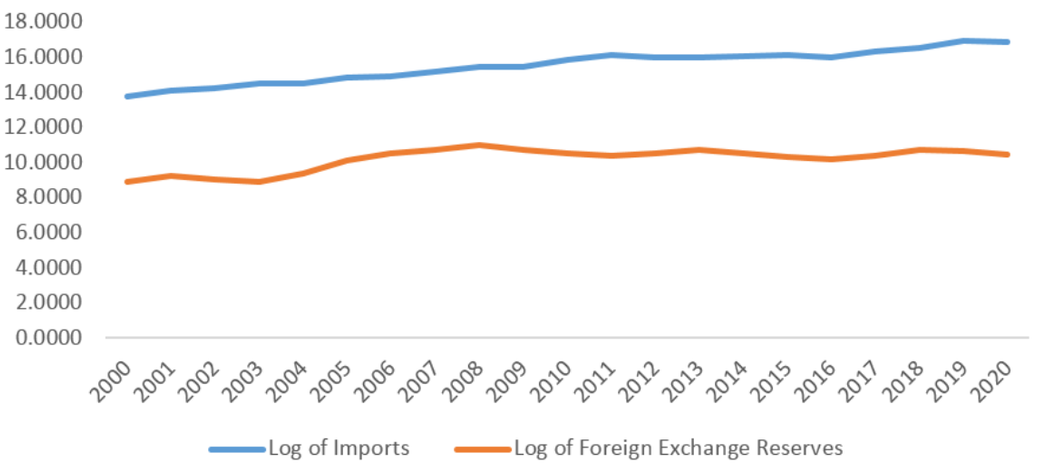


Figure 2. Trend of log of imports and log of foreign exchange reserves.

With imports rising over the years, the foreign exchange reserves have also been on the rise though with some fluctuations being prevalent in some years. This calls for examining if indeed, such movements have a significant influence on the demand for imports in Nigeria.

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3. Model Specification and Theoretical Backings

3.1. The Model

Our modelling of the relationship concerning import demand and exchange rate follows an adapted version of the model utilized by Thursby and Thursby (1984); Khalid and Al-Yousef (2002); Arize et al. (2004); Arize and Osang (2007) and Englama et al. (2013). In specifying the import demand function, they considered key variables like aggregate output (income), relative prices, exchange rate, and foreign exchange reserves. In that angle and building on their works, the model for this study is specified thus;

$$impt_t^* = (rgdp_t, mcpi_t, fxrs_t, excr_t) \quad (1)$$

In which $impt_t^*$ is the natural log imports, *rgdp* is the natural log of real aggregate income, *mcpi* is the import commodity price index, *fxrs* is the natural log of foreign exchange reserves, and *excr* is naira-dollar exchange rate. It follows that Equation 1 can be fine-tuned to suit estimation as follows;

$$impt_t^* = \delta_0 + \delta_1 rgdp_t + \delta_2 mcpi_t + \delta_3 fxrs_t + \delta_4 excr_t + \varepsilon_t \quad (2)$$

Where is the ε_t error term and δ_i are the parameters to be estimated. Data on each of the variables were sorted out form the 2020 version of Central Bank of Nigeria (CBN) statistical bulletin, and the data span from 2000 through 2020.

3.2. Theoretical Backings of the Functional Form and Sign of the Parameters Estimate

The specification of the import demand function in a log-linear format is in line with best practices as enunciated in Arize and Osang (2007) which could otherwise be tested for using Box-Cox (B-C) procedure (Zarembka, 1974) Bera and McAleer (BM) procedure (McAleer, 1987) and MacKinnon, White, and Davidson (1983) procedure (Gujarati, 2002).

Further, the above model captures that the import demand function follows a long-run equilibrium state, pointing to a cointegrating association. The fundamental principle of cointegration is that if a linear combination of the model's variables is stationary, two or more non-stationary time series may be taken to define a long-run equilibrium relationship (converges to an equilibrium over time). "The 'stochastic trends' in real imports are therefore related to the 'stochastic trends' in aggregate income, foreign exchange reserves, import commodity price index, and exchange rate if the import demand function designates a stationary long-run bond among the variables in the equation" (Arize & Malindretos, 2012). The variable will eventually return to its (long-term) equilibrium level even if deviations from the equilibrium do occur because they are mean reverting, as the previous sentence explained.

The $\partial impt/\partial rdgp > 0$ in accordance with the theory of demand. For two reasons, it would be expected that *impt* would upsurge as *rgdp* escalates. First off, with an unchanged income distribution, more foreign goods will be bought if an upturn in real income causes an upsurge in real consumption. Second, if a proliferation in income also results in an intensification in real investment, then imported goods must be purchased for investment purposes (Arize & Osang, 2007). Contrariwise, it is anticipated that $\partial impt/\partial mcpi < 0$ and $\partial impt/\partial excr < 0$ because, as import prices rise and domestic currency depreciates, consumers will turn to domestic goods instead. An upsurge in foreign exchange reserves is anticipated to have a favourable effect on the demand for imports because foreign reserves serve as a ceiling on the size of excess import demand hence, $\partial impt/\partial fxrs > 0$.

3.3. Technique of Analysis

Following the work of Arize and Osang (2007) this study utilized the 'Fully Modified Ordinary Least Squares' (FMOLS) to estimate the long-run estimates of the model to detect the direction of effect of the variables as predicted, and to detect whether they offer any significant weight on import demand. Apart from detecting the long-run influence, it is also pertinent to check if we could also obtain a similar result if the analysis is conducted in a short-run model. To this, the 'error correction model' (ECM) under the Representation theorem as put forth by Engle and Granger (1987) becomes a potent vehicle. The model for the estimation is specified thus,

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$$\Delta impt_t^* = \sum_{i=1}^{n}(\gamma_{1i}\Delta rgdp_{t-i} + \gamma_{2i}\Delta mcpi_{t-i} + \gamma_{3i}\Delta fxrs_{t-i} + \gamma_{4i}\Delta excr_{t-i}) + \sum_{i=1}^{m}\Delta impt_{t-i} + \emptyset + \theta ecm_{t-1} + \mu_t \quad (3)$$

Where ecm_{t-1} is the error correction term and the coefficient, θ, is the error correction coefficient which measures how import demand respond to per period deviation from equilibrium as reflected in Equation 1; with an assurance of a convergence conditional upon if $1 \geq \theta \geq -1$. The dependent and explanatory variables inclusive are expressed in first difference as revealed by the utilization of the difference symbol, Δ. The error-correction term (ecm_{t-1}) is present in Equation 3 because it is assumed that actual imports do not instantly adapt to their long-run determining factors. So, the equation provides the short-run factors that affect import demand and captures both the short and long-term dynamics of the series. Any imbalances in the long-term import demand are adjusted for in the short run.

4. Empirical Result

4.1. Establishing the Cointegrating Rapport

In establishing the prevalence of long-run equilibrium association, it is pertinent to first test if stochastic trends exist in the 'autoregressive representation'. To this, the Augmented Dickey-Fuller (ADF) unit root test becomes the potent tool to deploy. Table 4 reflects on the result, where the 5% critical value is -3.6908. It is pertinent to note that the null hypothesis states that "the variables are non-stationary. To overrule the null hypothesis, the value of the test statistic should be less than the critical value at 5%.

Table 4. ADF unit root test.

Variables	Levels	First Difference	Order of Integration
impt	-2.3384	-5.1462	I(1)
rgdp	-2.812	-4.8471	I(1)
mcpi	-2.9893	-4.0896	I(1)
fxrs	-2.5949	-3.8523	I(1)
excr	-0.835	-4.2292	I(1)

Note: The 5% critical value of the ADF is given to be -3.6908.

At levels, all the variables are reported to have a test statistic greater than -3.6908 confirming the non-rejection of the null hypothesis of non-stationarity at levels. Meanwhile, the variables, though not stationary, are reported to be integrated of order one as the first differencing revealed that their test statistic are less than 3.6908 at 5% critical value.

With the establishment of the non-stationarity of the variables at level, it is pertinent to proceed into determining if there is a cointegrating relationship concerning them. This is conveniently done using the Johansen cointegration test as put forward by Johansen (1988) since our variables are all integrated of order one. Table 5 captures the test result where we compare the Trace statistic with the 5% critical value. For cointegration to exist, it is mandatory that the Trace statistic must be greater than the 5% critical value, and this will be captured by $p < 0.005$.

Table 5. Test for cointegration among import demand, income, import commodity price index, foreign exchange reserves, and exchange rate.

Hypothesized Number of CE(s)	Eigenvalue	Trace Statistic	5% Critical Value	Probability
H_0: r = 0; H_1: r =1	0.97406	138.603	69.8189	0.0000**
H_0: r ≤ 1; H_1: r = 2	0.77093	69.2159	47.8561	0.0002**
H_0: r ≤ 2; H_1: r = 3	0.72273	41.2152	29.7971	0.0016**
H_0: r ≤3; H_1: r = 4	0.53822	16.8427	15.4947	0.0312**
H_0: r ≤ 4; H_1: r = 5	0.10755	2.16195	3.84147	0.1415

Note: The ** captures significance at 5% level.

Table 5 gives us the cointegration test result where r captures the number of cointegrating vectors. It is observable from Table 5 that the Trace statistic is greater than the 5% critical value up to when r = 4. The implication of this is that the model has four cointegrating equations. This clearly validates that a long-run

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relationship exist among import demand, aggregate income, import commodity price index, foreign exchange reserves, and exchange rate.

4.2. Long-Run Dynamics

In the specified log-linear long-run model, it is pertinent to note that our estimated coefficients are simply long-run elasticities. The result of the long-run dynamics is therefore captured in Table 6 where the FMOLS is utilized to estimate the size and magnitude of the elasticities in influencing import demand.

Table 6. Phillips-Hansen estimator (FMOLS) long-run estimates.

Variable	Coefficient	Standard Error	t-Statistic	Probability
rgdp	2.1489	0.26797	8.01906	0.0000***
mcpi	-0.0014	0.00042	-3.4308	0.0037***
fxrs	0.1237	0.0966	1.28052	0.2198
excr	0.0025	0.00068	3.70767	0.0021***
Constant	-9.1994	2.05694	-4.4724	0.0004***

Note: The *** captures significance at 1% level.

It is clear from Table 6 that our result showcases that import demand rapport is positive for aggregate income (*rgdp*), foreign exchange reserves (*fxrs*), and exchange rate (*excr*) but negative for import commodity price index (*mcpi*). Also, the estimated coefficients are significant at 1%, except for exchange rate which wields an inconsequential effect. This insignificant effect from exchange rate is of reality since irrespective of the exchange rate if a country, the demand for import will still be positive. The insignificant effect of exchange rate on import demand conflicts with earlier findings reported by Inyang and Effiong (2021) where it was observed that the long-run effect of exchange rate on import demand is negative and significant. The findings offer a robust theoretical forecasts concerning the bearing of income, import prices and foreign exchange reserves on imports demand, as it pertains to Nigeria.

Taking the relative strength of the identified determinants into consideration, aggregate income seems to have a higher effect as indicated by the magnitude of the coefficient (2.1489) compared to the import price (-0.0014). The magnitude of the coefficient of foreign exchange reserves also outweighs that of import prices but not up to that of income. The implication here is that the economic importance of income and foreign exchange reserves far exceeds the importance of import price variation on import demand. This is a clear scenario where it can be adduced that with income and adequate foreign exchange reserves, the price of import will not pose a greater influence on import demand in Nigeria.

Linking our findings with earlier studies, the income elasticity coefficient of 2.24 so estimated for Venezuela as reported in Arize and Osang (2007) is consistent with the income elasticity of 2.15 reported in Table 6 in our study. With our positive income elasticity, our findings differ from that of Sinha (1997) where a negative income elasticity of -1.032 was being reported for Thailand. The magnitude of our income elasticity also outweighs those reported by Arize and Osang (2007) for Argentina (0.54), Brazil (0.52), Colombia (1.73), Costa Rica (1.33), Ecuador (0.63), and Trinidad (0.66); plus, that reported by Arize and Malindretos (2012) for India (1.45), Japan (0.74), Korea (1.20), Singapore (0.73), and Thailand (1.02); and 0.09 reported by Butts and Mitchell (2012) for Guyana.

The import price elasticity estimate of -0.0014 is in tandem with the negative coefficient reported by Sinha (1997); Arize and Osang (2007) and Arize and Malindretos (2012) but the difference is that the absolute value of our estimated elasticity coefficient is far less than theirs. Meanwhile, it elasticity coefficient is similar to the findings of Inyang and Effiong (2021) where they obtained an elasticity coefficient of -0.0020 for Nigeria. For foreign exchange reserves, the estimated coefficient of 0.1237 is also less than 0.3 in the study conducted by Arize and Osang (2007) where all the countries considered, except Colombia with 0.65, had the elasticity coefficient of foreign exchange reserves to be less than 0.3. A similar less than 0.3 coefficient was reported by Arize and Malindretos (2012) for India (0.09), Japan (0.19), Korea (0.05), Singapore (0.22), and Thailand (0.21). One similar thing here is that our study reported a positive effect which was also being reported by the above studies.

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4.3. Short-Run Dynamics

Having established the long-run rapport amid import demand and the set of identified determinants, it is also pertinent to examine the possibility of such long-run rapport being noticeable in the short-run given the non-stationarity of the variables. In this, the short-run result is estimated and the result is presented in Table 7, where we utilized the ECM approach.

Table 7. Short-run dynamic error correction model.

Variable	Coefficient	Standard Error	t-Statistic	Probability
Δ(RGDP)	6.9300	1.105044	6.27125	0.0002**
Δ(RGDP(-1))	10.4904	1.177174	8.911507	0.0000**
Δ(MCPI)	0.1407	0.078322	1.795802	0.1103
Δ(FXRS)	-0.2643	0.111959	-2.360426	0.0399**
Δ(EXCR)	-0.0012	0.000735	-1.577767	0.1533
Δ(EXCR(-1))	-0.0047	0.001446	-3.226316	0.0121**
$ECM_{(t-1)}$	-0.7921	0.127923	-6.191854	0.0001**
R-squared	0.8662		Log likelihood	25.0118
Adjusted R-squared	0.8148		Durbin-Watson stat	2.0089

Note: The ** captures significance at 5% level.

The short-run effect of income (current and lag) exercises a positive and significant sway on import demand in line with the long-run prediction. Import price index now wields a positive (though insignificant) short-run waves on import demand against the negative effect established in the long-run. The positive influence aligns with the findings of Zhou and Dube (2011); Budha (2014) and such arises from the lack of substitutes in imported commodities (Vacu & Odhiambo, 2020). Foreign exchange reserves now put forth a deleterious sway on import demand, where such effect is significant and this is against the positive long-run effect earlier established. The finding agrees with that of Fatukasi and Awomuse (2011) where they also reported a negative weight of foreign exchange reserve on import demand in Nigeria. The exchange rate now put forth the expected negative weight on import demand in the short run, where the effect is also significant. As it can be observed, the elasticity coefficient of income (both current and lag) is far greater than that of import price index, pointing to the fact that import demand respond faster to income changes compared to price changes. Also, import demand respond faster to price income changes that to changes in foreign exchange reserves and exchange rate.

Going to the $ECM_{(t-1)}$ it is clear that the coefficient is negative (as required) along with being statistically significant at 5%. With the coefficient being -0.7921, it means that suffice import exceeds its long-run rapport with income, import price index, foreign exchange reserves, and exchange rate, the adjustment will be in a downward manner at a rate of 79.21% on a yearly basis. Given this scenario, the findings imply that (i) that disregarding the cointegration of the variables would have resulted in a misspecification of the core dynamic structure; (ii) that market forces exist in the imports market sector that function to re-establish long-run equilibrium after a short-run deviation; (iii) that it takes less than a year to correct 70% of the deviations from long-run equilibrium; and (iv) that the full adjustment of real imports to changes in the independent variables may take about one year and seven months. Our estimated R-squared points to the fact that our short-run model is capable to explain 86.62% of the overall short-run changes import demand, and the model is stable since our Durbin-Watson statistic is 2 pointing the total non-existence of serial correlation in the model.

Our estimated income elasticity coefficient of 6.93 and 10.49 for current and lag income changes respectively for the case of Nigeria is far greater than that obtained in the findings of Arize and Osang (2007) where it was reported for Argentina (0.209), Colombia (2.615), Brazil (0.820), Costa Rica (0.370), Ecuador (0.757), Trinidad (1.149), and Venezuela (1.149). The higher income elasticity coefficient also exceed those estimated by Arize and Malindretos (2012) for India (0.346 to 0.401 including the lags), Japan (0.126), Korea (0.254 to 0.482 including lags effect), Singapore (-0.243 to 0.895 lag inclusive), and Thailand (-0.623 to 0.775); and the 0.88 obtained by Englama et al. (2013) for Nigeria. With our study reporting a positive influence of foreign exchange reserves on import demand, our findings conflict with that of Arize and Osang (2007); Arize and Malindretos (2012) and Englama et al. (2013) where they reported a short-run positive influence for all the countries they examined.

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5. Conclusion and Recommendation

The aim of the paper has been to ascertain the potency of income, import prices, foreign exchange reserves, and exchange rate in influencing import demand in Nigeria. Such an analysis is conducted for both the short-run and long-run situations using data that captures 2000 through 2020. By first ascertaining the stationarity properties of the series using the ADF technique and uncovering that the series are non-stationary at level, we test for cointegration where the series were reported to have an element of cointegrating bond. With that the FMOLS was utilized to estimate the long-run effect while the error correction model (ECM) served as a tool for analysis in the short-run. The introduction of foreign exchange reserves is the core point of concern in the import demand function. In theory, an increase in foreign reserves may have a positive effect on import demand because it relaxes the excess demand liquidity constraint (Arize & Osang, 2007).

Going by the analysis, our result revealed certain strands of result:

(i) With the reported non-stationarity of the variables, the need to treat such becomes pertinent to drive at a tangible result. The need for the cointegration analysis pointed out that imports, income, import prices, foreign exchange reserves, and exchange rates are cointegrated; implying that they exhibit some level of long-run rapport. Foreign exchange reserve is a potent variable that influences import demand in the short-run and in the long-run. Meanwhile, the recorded short-run influence is negative and consequential while that of the long-run is positive and but insignificant. With the statistical impact of foreign exchange reserves being significant, the economic consequence on the contrary is weak as given by the elasticity coefficient when compared to the income elasticity coefficient.

(ii) That income and import prices play a crucial role in influencing import demand, with income wielding a positive and substantial sway while import prices put forth a negative and substantial influence. Income is also noted to wield a greater economic influence on import demand than import prices given their elasticity coefficient. With the elasticity coefficient for income being greater than one, import demand is thus income elastic, pointing to the fact that import demand increase in a significant manner as income increases. This implies that increases in real income are likely to exacerbate Nigeria' trade deficits. To the extent that governments are apprehensive about the trade balance, they may be forced to reduce income growth (for example, by contractionary fiscal measures). Furthermore, because the timing of import responses to income changes, strong domestic growth in these countries will stimulate the export activities of their corresponding trading allies.

(iii) For import prices, the long-run elasticity is far away from unity pointing out that import demand is price inelastic. This has implications on the efficacy of monetary and fiscal policy actions in curtailing excessive demand for import if there is a rise in income. This also points out that an expansionary policy accompanied with a depreciating exchange rate policy will not yield the desired result rather, a contractionary policy stance will work out. In short, petite price elasticity does not tend to mitigate negative J-curve effects on the Nigeria's balance of payments position. The petite price elasticity demonstrates that the Nigeria has made little progress in manufacturing that can substitute for imports.

(iv) Exchange rate has a significant statistical short-run influence on import demand in the short-run though the long-run influence was positive and significant as well. It is clear from the elasticity coefficient that both the short-run and long-run estimates were far below unity, pointing to the exchange rate inelasticity for import demand in Nigeria. Thus, it is clear from this that policies that is geared towards exchange rate depreciation (as earlier pointed out in the case of import price index) will not influence the level of import demand in Nigeria.

With the foregoing observations, policies aimed at snowballing foreign exchange reserves should be followed, as they have the potential to impact import behaviour. Policies aimed at growing foreign exchange reserves, for example, should be followed because they are probable to stimulate import behaviour. Policies, for example, would have to be geared toward export promotion. As identified by Esfahani (1991) cited in Arize and Malindretos (2012) exports are likely to increase reserves, allowing for greater access to international markets. Given the availability of reserves, trade policy should discourage efforts to borrow.

Action is also required in Nigeria to reduce the income coefficient to less than or equal to one. It is critical that import demand management be regarded as an aspect of an inclusive stabilization strategy. Imports should be targeted as part of this effort to compensate for shortfalls in domestic production or to change its quality and structure. Furthermore, strategies that reduce government spending or raise taxes (contractionary fiscal policy) could reduce income growth.

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Lastly, the importance of import prices and exchange rates in our long-run import demand function has a significant impact on the efficacy of exchange rate policy or commercial policy aimed at correcting trade imbalances and encouraging growth of export. The diminution in import volume will more than compensate for the upsurge in import prices. If the demand price elasticity for exports is significant, the 'Marshall-Lerner' condition is very likely to be met.

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