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FISH IMPORT MODEL FOR NIGERIA: A CASE FOR SELF-SUFFICIENCY

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ABSTRACT

The study examined the dynamic relationship between fish import and macroeconomic variables for self- sufficiency in Nigeria, for the period of 1980 – 2015. Using (A dynamic error correction model) as an analytical tool, this paper examines empirically the relationship between fish import and macroeconomic variables. The study made use of secondary data and examined time series characteristics of the variables selected to avoid the problems of spurious correlation often associated with non-stationary time series. In order to achieve linearity, logarithmic calculations were used to examine the variables. It was established that the price elasticity of import obtained (-0.041) indicates, currency depreciation may likely produce an effective result in reducing the demand for fish import. The paper recommends that the government and other relevant agency should apply a restrictive allocation of foreign exchange allocation to fish import subsector to check fish importation.

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INTRODUCTION

One of the greatest problems confronting millions of Nigerians today is an inadequate intake of quality o protein to feed the nation's ever-growing population. The resulting malnutrition affects mental capability, work productivity, and overall national economic growth (Okoruwa and Olakanmi, 1999). Nigeria is believed to be the largest consumer of fish and fish products in Africa due to its population size, economic status, and the dietary habits of its population. Despite having a coastline of 853 km bordering the Atlantic Ocean, as well as vast fresh and mangrove swamps, creeks, coastal rivers, estuaries, bays, and near and offshore waters, it is ironic that Nigeria still depends mainly on fish importation to meet most of her fish demands. According to the 2016 Nigeria's Fisheries Statistics report, annual fish demand is estimated at 3.32 million metric tonnes an unsurprisingly high number considering Nigeria's teeming population of about 186 million people but domestic production is only about 1.12 million metric tonnes annually. This leaves a deficit of 2.2 million metric tonnes, which is largely supplied by fish importation.

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Over the years, different governments have recognized the importance of fishery subsector and have made several efforts to boost their productivity. This includes, among others, the provision of fishing inputs like nets and outboard engines to fishermen at subsidized rates, the establishment of hatchery centres, research institutes and fisheries schools. Such efforts are also aimed at conserving the foreign exchange spent on importation of fish as more than USD 800 million is spent in hard currency and thousands of jobs are exported (FAO, 2017). The continuous importation of fish portends a colossal loss of foreign exchange earnings to Nigeria. In order to bridge the demand-supply gap, an aquaculture transformation agenda plans to increase annual fish production from the current production of 1.12 million metric tonnes to 3.0 million tonnes in order to achieve self-sufficiency in fish production and supply by the year 2020 (Tijani,2011). This will be achieved through fish farm development programme, providing credits facilities to fish farmers, fish seeds and feed mill development programme, fish pen and cage culture development programme and fish post-harvest management and marketing programmes. High rates of fish imports should constitute a major cause for concern to the nation's policymakers. Apart from constituting a major drain on the country's foreign earnings, the massive food imports indicate the continued dependence of Nigerians on foreign sources over which they have no control whatsoever.

Such a situation is not only politically risky but economically untenable in a nation which has abundant, potentially productive land and water resources for food products. In view of the heavy reliance on imported fish, there is a need for a clearer understanding of the import demand of the commodity by Nigeria. Reliable estimates of demand would be necessary to evaluate alternative methods and policies on fish imports. Similarly, a short-run analysis is useful to discover the seasonal demand patterns which can be of value in production planning and marketing. Also, an understanding of the underlying causes of variation in demand would be of considerable interest in assessing the impact of various track reforms instituted in the past as well as differences in the level of imports which are due to factors such as per capita income, population and tariffs.

Objectives of the Study

The study aims at analyzing the determinants of fish imports into Nigeria. In order to achieve this, the following specific objectives will be pursued:

- To examine the volume of fish imports into Nigeria between 1970 and 2015;
- To determine the variables influencing the importation of fish; and
- Make appropriate recommendations and suggest policies for fish import and future development of the fish industry in Nigeria.

METHODOLOGY

The empirical analysis for this study covers the period 1970-2015. Data were collected on such variables as the quantity of fish import within the studied period, the gross domestic product (GDP), the quantity of fish produced locally, quantity of other meat produced locally and the exchange rate in the country for the same period. Data were extracted from various books of records such as Annual Report and Statement of Accounts of the CBN; Annual Abstract of Statistics (BOS); United Nations Trade Year Book, FDF, IMF International Statistics Year Book and the FAO Trade Year Book (various issues).

Analytical Procedure: The study uses trend analysis in presenting variations in quantity and value of imports for the period under study.For the empirical analysis, the study employed an error correction model (ECM) to analyse fish import in Nigeria. This is a recent development is an econometric technique employed to avoid the incidence of spurious regression (Engle and Granger, 1987; Adams, 1992) which often results when OLS estimation technique is applied to estimate a regression model with time series data especially when the data are non-stationary.

Stationary Test: The Augmented Dickey-Fuller (ADF) unit root test was used to test for the stationarity of the data used for estimation (Dickey and Fuller, 1979). This involves running a regression of the first difference of the series lagged once, lagged difference terms, a constant and a time trend. We run a regression

$\Delta X_t = a_0 + a_1 X_{t-1} + a_2 \Delta X_{t-1}$ and then carry out the test to know whether the coefficient 'a' is statistically significant or not. The ADF t-statistics is then compared against the critical values at between 1 and 10 per cent to determine whether the variable X_{t-1} has a unit root.

Cointegration Test: This is the next procedure in ECM analysis which is to investigate further whether there is a long-run relationship called cointegration among the variables. This was done adopting the Johansen (1980) framework by comparing the likelihood ratios against their corresponding critical values at 5 per cent. If the various tests performed to support the fact that Cointegrating relationships exist between the dependent and any (or a combination) of its explanatory variables, then we need to set up a parsimonious error correction model (ECM). The ECM is used to analyze the response of fish import to a stimulus in the explanatory variables in a dynamic setting. The ECM is accepted when the residuals from the linear combination of non-stationary I (1) series are themselves stationary. The acceptance of ECM implies that the model is best specified in the first difference of its variables. Thus the application of cointegration paradigm will guard against the loss of information from long-term relationships in the first differences.The final equation for the study is represented as

(L) $\Delta FI_t = a_0 + a_1 (L) DAVP_t - a_2 (L) DFP_t + a_3 (L) DGDP_t + a_4 DEXR_t - a_5 (L) DBP_t + T - a_6 ECM_{t-1} + U_t$

Where:

FI_t → quantity of fish import into the country in time t ('000 tonnes).
AVP_t → average price of imported fish in time t (# /tonnes)
FP_{t-1} → local output of fish in Nigeria in the previous year ('000 tonnes)
GDP_t → the gross domestic product of Nigeria in year t.
EXR_t → official exchange rate in year t.
BP_{t-1} → local output of beef in Nigeria in the previous year ('000 tonnes)
T →time trend factor measured in years.
ECM (-1) → the error correction factor whose coefficient should be negative and statistically significant to support the existence of cointegration.

RESULTS AND DISCUSSION

The quantity of fish imported into the country has been fluctuating in an increasing pattern. Import figures show a phenomenal increase from mere 148,840 tonnes in 1980 to 313,987 tonnes in 1989, and this later fell to 118,987 tonnes in 1990. The quantity, however, went up to 253,278 tonnes in 1991. The average quantity fell from 176,640 tonnes for 1980 – 85 to 163,961.8 tonnes for 1986 – 1990 about 7.7 per cent (see Table 2). The annual average quantity continued to increase from 249,522.5 tonnes for 1991-1995, to 436,686.4 tonnes, about 75 per cent. This was then followed by an increase in average quantity to 772,896.4 tonnes recorded for 2011-2015. It can be inferred from Table1 that lower import quantities gave an indication of import restricting policies introduced for those periods. The probable explanation for this is the liberalization of fish import as well as an increase in demand as a result of the effect of state creation in 1976. Also, there was a shift in the dietary habit of a large number of working-class population in favour of imported fish as the effect of the Udoji award began to be felt (Fajana. 1977).

Trend value of Fish import: Nigeria's fish import bill declined from an average of #208,140.9 for 1980 – 1985 to

#50,275.29 million for 1986 – 1990. The value then rose to #3,015,892.61 for the period, 1991 – 1995 and later went up to a whooping #63 billion for 2001-2005. The annual average of #57 billion and a coefficient of variation of 0.674 as compared with an average of #2.6 billion and a variation coefficient of 1.61 for the period.

Determinants of Fish import in Nigeria: The result of the OLS regression analysis is shown in Table 2. It shows that the explanatory variable used explained 74 per cent of the variation in the dependent variable (quantity of fish import). Price of fish import (AVP), local beef production (BP), gross domestic product (GDP), local fish production (FP), and exchange rate are statistically significant. However, we went further to investigate the time series characteristics of the data used for the estimation of the model to avoid spurious regression. Table 4 presents the results of the stationarity test.

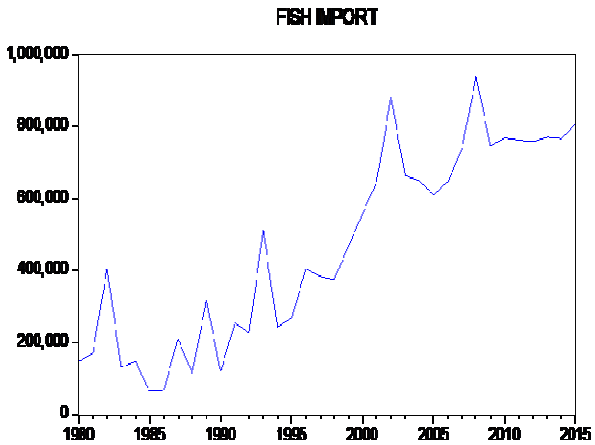
Empirical Results of the Dynamic Model (ECM): It is obvious from the coefficient of multiple determination (R^2) that the model has a good fit as the independent variables were found to jointly explain 98 per cent of the movement in the dependent variables (see Table 5). The independent variables; price of fish import, the local output of fish, gross domestic product, exchange rate and local output of other beef included in the model are the major determinants of quantity of fish import (LFI) in Nigeria. The fitness of the model is confirmed by the F-statistic which is significant at 5 per cent. The results also show that the coefficient of one to three period-lagged difference of local fish production (LFP), exchange rate of two to three periods lagged (EXR) difference, one to three period lagged difference of output of fish and one period lagged difference of gross domestic product are statistically significant at 15 per cent respectively. All coefficients of the other explanatory variables are statistically significant at less than 10 per cent level. For instance, the coefficients of the price of fish import (LAVP) and its one- three years lagged components are significant at 5 per cent. Similarly, are coefficient of the one-period to a thee-period lagged output of (LFP) are significant at 15 per cent, respectively, while the coefficients of the variable, gross domestic product (GDP) and its two-period lagged components are significant at 5 per cent respectively. The coefficient of exchange rate (EXR) variable and all its lagged components and output of beef (LBP) and its lagged components are significant at 15 per cent.

Contrary to expectation, the empirical results show that the coefficient of the price of fish (LAVP) and the output of local fish (LFP) does not comply with the a priori expectations. That is, they have positive coefficients. The significance of the price variable implies the importance of price – both present and previous as a determining factor in the consumption of the commodity. The negative coefficient of the local output of fish (LFP) indicates that the quantity of fish import decreases with an increase in the amount of domestic production. The lagged output of fish also has a significant coefficient indicating the importance of previous domestic production on the quantity of fish import. This local production of fish should be boosted to ensure self-sufficiency in fish and if these resources are well managed, it will promote entrepreneurship, create employment opportunities, improve our economy and foreign exchange through contribution to GDP and ultimately reduce the need for fish importation. The gross domestic product (GDP) which is used as a proxy for national income shows a positive coefficient in compliance with the theoretical expectation (Oyejide. 1986; Ajayi, 1975). The higher the national income, the higher the quantity of imported fish. It should be noted, however, that two-period lagged gross domestic product shows a negative coefficient. This is also possible as an increase in income could actually bring about an expansion in domestic production and this will be followed by a reduction in the volume of import. The coefficient of the domestic output of beef shows a negative sign both at its present levels and the third period lagged and they are all significant at 15 per cent. This negative sign complies with the a priori expectations. An increase in the local production of beef results in a decline in the quantity of fish imported. This could be explained in that beef produced locally are a perfect substitute for imported fish. The nominal exchange rate has coefficients with a positive sign. That is, the higher the exchange rate (appreciation), the higher the quantity of fish import. A decrease in the exchange rate (devaluation) will increase the domestic price of imported fish and consequently leads to a reduction in the volume of imported fish and consequently leads to a reduction in the volume of import into the country. Fish import could, therefore, be discouraged through this policy as shown by the result of this analysis. The lagged ECM coefficient is significant at 1 per cent validating the error correction model specification. It indicates a speed of adjustment of about 88 per cent from actual imports in the previous year to equilibrium imports implying that errors are fully corrected within a year.

Elasticities of Fish Import: The coefficients of the independent variables used for the study represent the various elasticities of import with respect to each variable. This is so, as the ECM analysis is presented in the double-log form. The elasticities are presented in Table 6. Fish import into Nigeria is inelastic with respect to import price.

Table 1. Average Quantity and Value of Fish Import

Year	Average Quantity Tonnes	Average Value ₦(000)
1980 -1985	176,640	208,140.9
1986 - 1990	163,961.8	502,775.29
1991 - 1995	249,522.5	3,015,892.61
1996 - 2000	436,686.4	2,375,088.92
2001 - 2005	690,416.6	63,440,154.82
2006 - 2010	767,834.6	99,396,663.0
2011 - 2015	772,896.4	315,146,116.10
1980 – 2015	464,333	57,320,392.0
CV	(0.583)	(0.674)



This is expected as the quantity of fish imported by the country is not large enough as compared to the world's total output to significantly influence the world price.

Table 2. Result of Static Model Estimating using OLS (1980-2015)

Dependent Variable :Quantity of Fish Imported				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	35.87921	8.695799	4.126039	0.0003
LAVP	0.156313	0.042716	3.659324	0.0010
LBP	-0.703565	0.322614	-2.180825	0.0378
LGDP	-0.972200	0.384888	-2.525928	0.0175
LFP	0.691898	0.328275	2.107677	0.0441
EXR	0.007841	0.002325	3.372007	0.0022
R-squared	0.787015			
Adjusted R-squared	0.741375			
F-statistic	17.24406			
D.W. Statistics	1.790927			

Source: Computer output

Table 4. Results of stationarity (ADF Unit Root) Tests

Variables	ADF Statistics	Critical Values @ 1%	No of Lags
Δ(EXR)	-5.2760	-3.6394	1
Δ(LAVP)	-8.0500	-3.6394	1
Δ(LBP)	-6.5305	-3.6394	1
Δ(LFI)	-10.8282	-3.6394	1
Δ(LFP)	-6.3277	-3.6394	1
Δ(LGDP)	-4.8250	-3.6394	1

Table 5. Modelling the Determinants of the Quantity of Fish import (Qty) by OLS (A Dynamic Error Correction Model

Dependent Variable: Log of Quantity of Fish Import (LFI)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	13.61612	0.165032	82.50591	0.0000
D(LAVP,2)	0.083096	0.041389	2.007689	0.0847
D(LAVP(-1),2)	0.101316	0.047380	2.138365	0.0698
D(LAVP(-2),2)	0.104252	0.041150	2.533479	0.0390
D(LFP,2)	0.078808	0.426411	0.184816	0.8586
D(LFP(-1),2)	-0.034216	0.570372	-0.059989	0.9538
D(LFP(-2),2)	0.552337	0.936593	0.589729	0.5739
D(LFP(-2),3)	-1.161555	0.643552	-1.804912	0.1141
D(LGDP,2)	1.596431	0.804554	1.984244	0.0876
D(LGDP(-1),2)	-0.622780	0.943518	-0.660061	0.5303
D(LGDP(-2),2)	-2.835649	1.022494	-2.773267	0.0276
D(EXR,2)	0.008385	0.005474	1.531881	0.1694
D(EXR(-1),2)	0.002029	0.004399	0.461254	0.6586
D(EXR(-2),2)	0.003442	0.006961	0.494511	0.6361
D(EXR(-2),3)	-0.006263	0.003942	-1.588630	0.1562
D(LBP,2)	-2.167869	0.838809	-2.584461	0.0362
D(LBP(-1),2)	-0.601336	0.680172	-0.884095	0.4060
D(LBP(-2),2)	0.213519	1.245387	0.171448	0.8687
D(LBP(-2),3)	-0.257994	0.791965	-0.325764	0.7541
ECM(-1)	-0.883204	0.263070	-3.357292	0.0121

R^2 = 0. 96 DW =1.81 F- statistic =28.7 (significant at 1%).

Source: Extract from computer output

Table 6. Elasticity Coefficients

Independent Variables	Elasticities
LAVP	0.041
GDP	-2.836
FP	-1.162
BP	0.214

The implication of this is that fluctuation in the price of imported fish will not influence significantly the quantity of import. As identified by Fajana (1977) and Mwega (1977). The elasticity of import with respect to the output of local fish is fairly elastic (-1.162) while GDP and output of beef (LBP) have elasticities of -2.836 and 0.2135 respectively. Thus, the demand for fish import could be described as income elastic and therefore be classified as a luxurious item. This is because import demand decreases with an increase in national income. Lastly, the local output of fish elasticity (-1.162) shows the importance of domestic production in checking the importation of the commodity. A 100 per cent increase in local production will reduce quantity imported by more than 116 per cent. The implication is that policy measures that are targeted at improving domestic production of fish can be effectively used in checking the quantity of fish imported.

Conclusion

The findings of this study have shown that Nigeria's fish import as part of other food import has continued to constitute a drain on the economy's already lean foreign exchange reserves. Imported fish continues to dominate fish consumption in the country. However, as a result of trade liberalization agenda, and the country being a member of the World Trade Organization (WTO) cannot ban the importation of fish out rightly. The overdependence of Nigeria on imported food items in general and fish, in particular, is an unhealthy situation for the development of the food sector, thus jeopardizing the move towards self-sufficiency. However, if the vast potential for domestic production is effectively tapped, Nigeria can become self-sufficient in the supply of fish both for local consumption and export.

Recommendation

To ensure self-sufficiency in fish, efforts should be made to increase local production to meet the fish demand by the populace. In that regard, there is need to evolve policies and programmes that will help local producers in the following area:

There should be an efficient inputs market that promotes private sector participation under a competitive market structure.

- Efforts should be made to improve the fishing industry, especially aquaculture. Aquaculture could create the sustainability and food security needed in the industry giving room for conservation in wild fishing.
- Adequate funding should be made available for research to develop high-quality fish feeds at the low cost of production that competes favourably with imported fish feeds.

Apart from boosting local feed production, attention should be directed towards finding ways of improving aquaculture production in Nigeria. This could be achieved through government intervention in setting up fish feed mills in the major areas of production and/or granting loans with the single-digit interest rate to industrialists willing to go into fish feed-milling. Credible and stable macroeconomic policies must also be directed at increasing the price of import which could be used to check the volume of import. As the price elasticity of import obtained (-0.041) indicates, currency depreciation may likely produce an effective result in reducing the demand for fish import so as to support trade liberalization efforts. Lastly, restrictive allocation of foreign exchange to fish import subsector can be used to check the importation of fish. This is because under foreign exchange constraint, the volume of import will depend on the number of foreign exchange importers can access and priorities should be attached to various imports in foreign exchange allocation.

However, to ensure that this policy works, measures should be put in place to safeguard its abuse.

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