JOURNAL OF AGRICULTURAL ECONOMICS, EXTENSION & SCIENCE ISSN (Print) 2545-5179, ISSN (Online) 2714-5018
Official Journal of the College of Agricultural Economics, Extension & Science JAEES Vol. 7 No. 2 2021, Pages 125 - 136
www.jaees.org

SUPPLY AND DEMAND VOLATILITY GAP IN INDUSTRIAL FISHERY SECTOR AND IT'S IMPLICATIONS ON NIGERIA ECONOMY: 1980-2014

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Abstract

The study focused on the economic evaluation of industrial fishery sector in Nigeria 1980-2014. Secondary data on supply and demandcovering 1980-2014 were obtained from National Bureau of Statistic (NBS), Federal Department of Fishery (FDF)and Central Bank of Nigeria (CBN). Augmented Dickey Fuller Test to check for the stationarity of the data. Autoregressive Conditional Heteroscedasticity (ARCH) model was used to examine the gap between supply and demand volatility. Johansen Co-integration model was used to evaluate the long run relationship between industrial fish supply and economic growth, while simulation method was used to project the industrialfish supply in Nigeria from 2015 – 2030. The ARCH result shows that, there was a significant volatility gap between supply and demand of industrial fish at 5% level of significance. The Johansen Co-integration test showed a long run relationship between industrial fish supply and economic growth as the trace statistic of 19.3464 exceeded its critical values of 15.41.The projected supply trend was declining. Conclusion was reached, that there was a volatility gap between supply and demand of industrial fish and also long-run relationship exist between industrial fish supply and economic growth in Nigeria. Based on these findings, it was recommended that government should make provision for agricultural credit facilities via ECOWAS funds and other international bodies to assist fish production projects and investment in Nigeria.

Keywords: Economic, Industrial, Fishery sector,Supply, Nigeria, Volatility.

Introduction

Adewuyi*et al.* (2010) affirmed that commercial fishing continues to be a major economic

sector in many countries. In addition to the large worldwide value of the catch, approximately 36 million people (15 million full-time, 13 million part-time, and 8 million occasional) are employed in both the capture and the culture fisheries.

Marine fishing had been the main stay of the economy for coastal dwellers since pre-colonial era, due to the littoral characteristics of the region. It had been serving the socio-economic needs of the people adequately. In the wake of oil exploration in Nigeria from the1970s, marine fishing, a highly dependable economic sector, had been neglected by the youths and governments despite its huge contributions to both regional and national developments.Industrial fishery is an important sector for the nation's economic development, at a time when government is seeking for ways to diversify the economy, from being purely oil based. It is a potential means of contributing to the food security of the nation, directly by producing fish for food and indirectly by generating employment for the teaming unemployed populace, save foreign exchange and generate foreign exchange through export of fish and fish products. Offshore, according to Atimitse (2012), is the fastest growing fish producing industry in the world. He stated that global offshore production has quadrupled over the past twenty years and that offshore production is likely to double in the next fifteen years, as a result of wild fisheries approaching their biological limits and the world demand for fish continuing to increase. In Nigeria the annual fish demand as at 2012 is 2.66 million metric tonnes, with supply being only 1.32 million metric tonnes. Out of this figure, local production is 0.62 ,offshore accounts for only 200, 00 metric tonnes. The current offshore production is a far cry from its potential production of 2.5- 4.0 smillion metric tonnes. Thefluctuaction in supply to equate demand for industrial fish is as a result of its multiple dimensional uses and geometrical increase in our population. Okuduwor and okidim(2020)established that the inequalityof supply and demand for industrial fish has negative effect on the price.there are indications that industrial fishery sector contribute to our national economic growth(Andersen,1993), other studies like the state of world fisheries statistics (Pontecorvo,1988), Supply side uncertainty and management of commercial fisheries (Pontecorvo, 2001) has been done, but this study with the broad objective to examine the supply and demandvolatility gap of industrial fishery sector and it's implications on Nigeria economy: 1980-2014,isa very important research gap to be filled,, the fluctuating and challenges for fish supply to equate its demand because of its multiple uses. The specific objectives for this study are to:

i. estimate the gap between supply and demand volatility of industrial fishes in Nigeria.

ii. analyze the long-run relationship between industrial fish supply and economic growth

iii. project the industrial fish supply in Nigeria from 2015 – 2030

Hypotheses of the Study

H_{01}: there is no significant gap in the volatility of supply and demand of industrial fish.

H_{02}: there is no significant long run relationship between industrial fish supply and economic growth.

Methodology

The study was carried out in Nigerian within the exclusive economic zone of 200 nautical miles and above in our Atlantic ocean. It has a coastline of 853 km which borders the Atlantic Ocean in the Gulf of Guinea in the south. The states along the coast are:AkwaIbom, Bayelsa, Cross River, Delta, Lagos, Ogun, Ondo and Rivers. These waters include the continental shelf along more than 800 kilometres of coastline. Apart from these interruptions and some offshore oil prospecting installations, the shelf is considerably trawlable.

Secondary data were used for the study.Time series data for industrial fish supply were obtained from Federal Department of Fisheries (FDF), Central Bank of Nigeria (CBN) and National Bureau of Statistics (NBS), covered 1980 to 2014.

Objective 1: on the supply and demand volatility gap for industrial fishes in Nigeria from 1980 to 2014 was examined using Autoregressive Conditional Heteroskedasticity (ARCH) model.

Objective 2: on the long run relationship between industrial fisheries supply and economic growth was evaluated using Johansen co-integration model.Objective 3;

Model specification

The model of the ADF test with the constant term and trend is as follows:

$$\Delta Y_t = \alpha_1 + \alpha_2 t + \beta Y_{t-1} + \sum_{i-1}^{n} \theta_1 \Delta Y_{t-1} + \varepsilon_t \quad \text{..... (1)}$$

ARCH (1,1) Model

The mean equation for the ARCH (1,1) model for industrial fishery supply is given as:

$$QS = \beta_0 + \beta_1 x_{1t} + \beta_2 x_{2t} + \beta_3 x_{3t} \dots\dots\dots\dots \beta_n x_{nt} + u_t \dots\dots\dots\dots\dots\dots (2)$$

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Where QS = quantity of industrial fish supplied

$Qty\ DD$ = Quantity demanded of industrial fish

B_o = constant

B_i = coefficient

X = variables of interest

U_t= error term

Substituting with the variables of interest, we rewritten equation (11) as;

$$QS = \beta_0 + \beta_1 Qty\ DD + u_t, \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3)$$

Johansen Co-Integration model for long run relationship

A linear combination of two or more I(1) series may be stationary or I(0), in which case they are co-integrated.

Johansen Co-Integration model for long run relationship

A linear combination of two or more I(1) series may be stationary or I(0), in which case they are co-integrated. For co-integration test (H_0: r >0 or = 1)if the null for non-integration is rejected, the lagged residual from the co-integrating regression is impose as the error correction term in a vector error correction model (VECM), given below as:

Π = (n x n) coefficient matrix associated with lagged values of the endogenous variables.

Y_{t-I}= lagged value of Y_t

τ = (n ×(K – 1) matrix of short term coefficients

υ= (n × 1) vector of constant.

E_t = (n ×1) vector of white noise residuals u_t

Equation for long run relationship

The model for the long run relationship between supply of industrial fisheries and economic growth is specified as:-

$$QS = EG \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (5)$$

The model for long run relationship of industrial fish supply and economic growth was given explicitly as

$$\ln QS_t = a_o + a_1 \ln EG_t + u_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

A priori expectation: the coefficient of the dependant variables are expected to have a positive relationship with the independent variables.

Result and Discussion

The Industrial Fish Supply and Demand Volatility

The ARCH model (Autoregressive Conditional Heteroskedasticity) was used to estimate the gap between demand and supply volatility of industrial fish as shown on table 1, 2.and 3.

The result from the ARCH shows on table 3 is significant at P value of 0.014 indicating the existing volatility gap, the quantity supply with co-efficient value of 34.8and quantity demanded with co-efficient value of 48.2195 indicated that the supply is less than the demand of industrial fishes in Nigeria.This calls for rejection of the null hypotheses that there is no significant difference between supply and demand volatilities of industrial fishes in Nigeria. The result established a significant gap of higher demand than supply of industrial fishes, a further increase in industrial fisheries supply is uncertain, demand for fish is projected to continue increasing due to population growth and urbanization (Romer,1986). This trend is likely to be more pronounced in Nigeria and other sub-Saharan African countries where many industrial fisheries have reached their limit, and aquaculture development is failing to keep pace with population growth. Per capital fish consumption in Nigeria and sub-Saharan Africa is lower than any other region, and it is the only part of the world where consumption is declining (World Fish Center 2005a).

Table 1: Supply Volatility

Industrial fish supply	Co-efficient.	Standard error	t-statistic	P > (*t*)
arch L1	34.8	3.592663	9.69	0.000

Source:-Data Analysis (2017).

Table 2: Demand Volatility

Industrial fish demand	Co-efficient.	Standard error	t-statistic	P>(*t*)
arch L1	48.2195	17.86062	8.30	0.000

Source:-Data Analysis (2017).

Table 3: Supply and Demand Gap

Industrial Fish quantity Supplydemand	co-efficient	standard error	Z-statistics	P>Z
arch L1	-.0097301	.0039439	-2.47	0.014
Const	28.85743	1.117022	25.83	0.000

Source:-Data Analysis (2017).

The Long Run Relationship between Industrial Fish Supply and Economic Growth

Johansen Co-integration model was used to estimate the long run relationship between industrial fish supply and economic growth (GDP), details on Table 4.According to Damodor and Dawn (2009) co-integration can be used despite the time series being individually non stationary, a linear combination of two or more time series can be stationary, the Engle-Granger (EG) and the Augmented Engle-Granger(AEG) test can be use to findout if two or more time series are co-integrated. Co-integration of two or more time series suggested that there is a long-run or equilibrium relationship between them.

The result showed that, trace statistics of 19.3464 exceeded its critical value of 15.41 at 5% level of significance. Hence, the null hypothesis of no co-integration equationswas rejected. Also, the maximum statistics value of 7.4812 was greater than its critical value of 3.76 at 5% level.This means we reject the null hypothesis that only one co-integration equations exist. That implies that, the Johansen test that there was co-integration relationships between the industrial fish supply and the gross domestic product GDP over long period of time was significant.This also implies that greater quantity supply of fish from the sector will contribute immensely in boosting the GDP (economic growth) especially in time like this that we need a diversified economy. A large portion of industrial fish production is now destined for export (Huppert*et al.* 2004). Over 30 percent of fishery commodity production in developing countries is destined for export (FAO 2007), and it is an important source of foreign exchange for many countries. While

industrial fishing activity continues to produce a significant portion of fisheries exports in some countries, much of the recent increase in exports from developing countries has come from small-scale fisheries. Much of this is driven by rising demand for high-quality demersal fish in developed countries. An increasing amount of trade in fish products is between developing countries, however, rather than from developing to developed countries.

Demand for fish in developing countries continues to grow, due both to population growth and increased per capita consumption, while overall demand in developed countries (including the USSR) has stagnated since 1985. While there is increasing demand for higher value fish in developing countries, low-value fish continue to make up the bulk of fish consumed there, and they are projected to remain net exporters of high value finfish and importers of low-value food fish (Halwart *et al.,* 2010).

Table 4: Estimating the Long-run Relationship between Industrial Fish Supply and Economic Growth (GDP) using Johansen Co-integration Model Sample: Trend Constant 1984-2014

Max. rank	Perm	LL	Eigen Value	Trace Stat.	5%Critical value	1% critical value
0	6	-41.40585		19.3464*1	15.41	20.04
1	9	-35.47325	0.31802	7.4812	3.76	6.65
2	10	-31.73265	0.21442			

Source: Data Analysis (2017).

Max. rank	Perm	LL	Eigen Value	Max Stat.	5% Critical value	1% critical value
0	6	-41.40585		11.8652	14.07	18.63
1	9	-35.47325	0.31802	7.4812	3.76	6.65
2	10	-31.73265	0.21442			

Source: Data Analysis (2017).

The Growth Projection of Industrial Fish Supply in Nigeria from 2015-2030

Simulation method was employed from the mean of the supply growth over the years, and the supply quantity for the sector was projected as shown on table 5.The information displayed on table 5shows a steady declination in supply growth projection for Nigeria industrial fishery sector from 2015 -2030, as also reflected on the trend.

Inspite of the FAO target to achieve hunger free by 2030, the contribution of industrial fish supply is still on the decline, the implication is largely dependence on imported fish and fish products in the country, this is a threat to food security and income generation as well as economic leakage in the nation at large.

Nigeria is the most populous black nation in the world, with an estimated population of about 190.9 million people (World Bank, 2017). Its citizens as at the end of 2012 have a projected fish demand of 2.66 million tonnes of fish. Fish supply within the same period was 1.32 million tonnes. This figure was made up of 0.7 million tonnes from importation and 0.62 million tonnes from both artisanal and offshore. Fish, a relatively cheaper source of food protein is very important in the diet of many Nigerians and is thus in high demand. The Nigerian fishery sector is characterized by a rich resource base, comprising of harvests from capture and culture. Due to over exploitation of the capture fisheries Production from offshore is increasing and supplied between 5 – 22% of total domestic fish production between 2000 and 2007(Olapade et al,2010).

For offshore to be sustainable, production systems must focus on the interactions between the culture techniques and the environment. It is pertinent to note that the growth and the expansion of offshore as an industry occurred during a period of growing concern of its environmental implications. Opportunities exist for the government to improve farm productivity through the promotion of appropriate responsible production, extension technologies and policy that is environmentally friendly (Quinn 1999)..

According to the fishery statistic of Nigeria (FSN 2007) fourth edition yearly report, enumerated several factors that contributed to the decline in the supply of industrial fish in Nigeria to include viz:-

i. High cost of fishing Vessels and its maintenance.

ii. Low level of government and private sector participation in the marine fishery business.

iii. Lack of effective institutional support linkage.

iv. Lack of access to affordable credit and insurance scheme to cover the interested entrepreneur.

v. Poor management and non-effective utilization of most of the nations numerous water bodies.

vi. Shortage of competent and experienced technical man power.

vii. No systematic monitoring, control and surveillance mechanism.

viii. Illegal exploitation of the marine fisheries resources particularly by foreign Vessels.

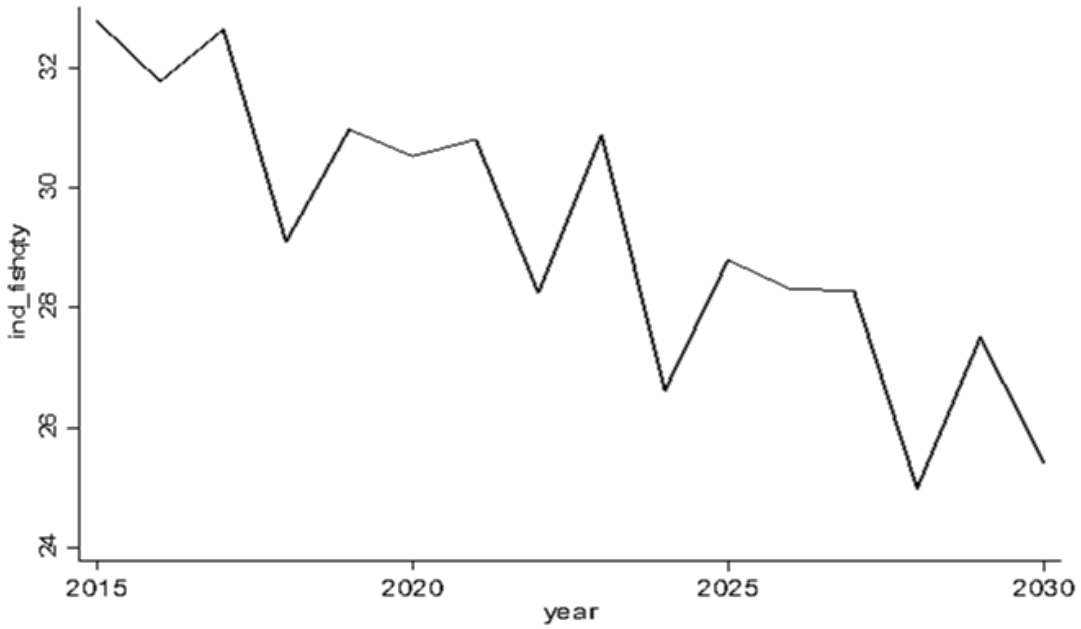
ix. High level of sea piracy and incessant harassment of fishing trawlers by militants in the marine waters.

Clark (1990), argued that most government programmes impacts did not get to the terminal target hence the economic constraint in the industrial fishery sector appear to be continuous.

Table 5: Industrial Fish Supply Growth Projection in Nigeria from 2015-2030

t	year	industrial fish supply quantity (million tones)
1	2015	32.56853
2	2016	33.78215
3	2017	32.51835
4	2018	32.55915
5	2019	31.42238
6	2020	32.11506
7	2021	29.64444
8	2022	30.48419
9	2023	28.9372
10	2024	27.06301
11	2025	28.82384
12	2026	26.8071
13	2027	29.83273
14	2028	26.93511
15	2029	26.17632
16	2030	25.32905

Source: Data Analysis (2017).



Source: Data Analysis (2017)

Figure 1. Industrial Fish Supply Growth Projection Trend in Nigeria from 2015-2030

Conclusion and Recommendation

Conclusion was reached, that there was a volatility gap between supply and demand of industrial fish and also long-run relationship between industrial fish supply and economic growth in Nigeria, and the industrial fish supply future growth projection decline from 2015-2030. Based on these findings, it was recommended that government should make provision for agricultural credit facilities via ECOWAS funds and other international bodies to assist fish production projects and investment in Nigeria.

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