

Empirical Evidence of Fisheries Sub-Sector's Contribution to the Nigerian Economy

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Abstract

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The study examined relationship between the Gross Domestic Product (GDP) of Nigeria with the inputs of labour, capital and the output of fisheries. This is to ascertain that the fisheries contribution to the economy is more than is recorded in the sense that taking its indirect and direct economic impact into account, its overall contribution to the GDP of Nigeria may be higher than that measured by the national accounts. The Co-integration test was carried out; the trace statistic test reveals that at 5% level of significance, that at most 2 equations are co-integrated, since their absolute values are greater than the critical values at 5% level of significant. The Max-Eigen values also reveals that at 5% level of significance, that at most 2 equations are co-integrated, since their absolute values are greater than their critical values (i.e. $89.23411 > 31.46$ and $46.65230 > 25.54$). This corroborated the trace statistics, therefore, it is concluded that there is a long run equilibrium relationship between the 4 identified variables (GDP, F, K, L) in the model. The results established the fact that the fisheries sub-sector of Nigerian economy could be regarded as economic base of the country, especially in the coastal part of the country in which the life of people depend on fish based live hood strategies. [Mafimisebi and Thompson. Empirical Evidence of Fisheries Sub-Sector's Contribution to the Nigerian Economy. International Journal of Agricultural Science, Research and Technology, 2012; 2(1):31-35].

Key words: Fisheries, Nigeria, Co-integration, Economics Base

1. Introduction

Nigeria is blessed with a vast expanse of inland freshwater and brackish ecosystems. However, these water resources are spread all over the country from the coastal region to the arid zone of the Lake Chad Basin (Adegbihin, 2008). The country has an extensive mangrove ecosystem of which a great proportion lies within some Niger Delta States of Akwa Ibom, Bayelsa, Cross River, Delta, Ondo and Rivers (FAO, 2009). Also, prior to Nigeria's independence in 1960, fishing has been carried out in many rivers, creeks, and lagoons with trawlers operating along the coast. Also, some states of the Federation (Akwa Ibom, Balyesa, Cross River, Delta, Lagos, Ondo States and Rivers.) are bordered by the Atlantic Ocean. Consequently, fisheries have been playing a major economic role in the life of rural households by providing employment and source of income (Shimang, 2010).

The contribution of fisheries to the nation's economy is very significant in terms of employment, income generation, poverty alleviation, and provision of raw materials for the animal feed industry. According to Okafor (2007), it is estimated that over 10 million Nigerians are actively engaged in primary and secondary fisheries operations as fisher folks, fish farmers, fish processors, marketers, operators' on-board industrial fishing fleet, terminal/jetties

operators, net makers and menders, engine repairer and fitters, etc. More so, the Niger Delta is the second largest brackish habitat in the world and shrimp is one of the most valued resources after crude oil. Nigerian shrimp is considered one of the best in the world and generated foreign exchange worth over US \$50 million annually (Okafor, 2007).

However, due to the activities of oil companies in the Niger Delta area, Nigeria is now one of the largest importers of fish in the developing world, importing about 600,000 metric tons annually. In year 2007, Nigeria spent over 600 million naira alone (Federal Ministry of Agriculture and Water Resources (FMA&WR), 2009). The large importation of fish poses a challenge to the Nigerian fisheries sector to strive to meet domestic demand. This has led to efforts by the Federal Government to make fisheries policy a sub-component of the Agricultural Sector policy in the various National Development Plans.

In view of the above, this study intends to investigate the existence of long-run equilibrium relationship between National GDP and the fisheries sector of the economy. This with the aim of establishing empirically the importance of the fisheries sub-sector to the Nigeria economy which will guide the government at all levels both to develop policies and improve on the execution of the

existing policies that will give priority to fisheries sub-sector.

Theoretical Framework

This study was based on the economic base theory as propounded by German economic historian named Werner Sombart in 1910 (Schaffer, 1999). Economies may be seen as a collection of industries. In the national accounts, the contribution of each of these industries to the GDP is measured by their value-added. Thus, superficially, it may appear that the economic importance of each industry is also measured by the same number. However, casual observation suggests that some industries at least play a role in the overall economic activity that differs from this measure. In particular, certain industries appear to be more fundamental than others in the sense that taking their indirect as well as their direct economic impacts into account, their overall contribution to the GDP is higher than that measured by the national accounts (Tiebout, 1962).

Removing such an industry would therefore lead, *ceteris paribus*, to a reduction in the GDP in excess of its direct contribution to GDP as measured by the national accounts. It is even possible that economies depend wholly on certain industries in that they came into being as a result of these industries and would collapse if those industries were removed (North, 1955).

The economic base is simply an industry or a collection of industries that are disproportionately important in a region's (or, for that matter, country's) economy. The other economic industries depend on the operation of the economic base (Noel et al, 2006). The idea of the economic base has a long history. Schaffer, (1999) traces the origins of this theory back to the Mercantilists, who regarded any activity conducive to a favourable balance of trade as the nation's economic base, and later the Physiocrats who regarded agriculture as the national economic base (Krumme, 1968). The modern concept of the economic base was initially formulated by the German economic historian- Werner Sombart in 1910 (Schaffer, 1999), but has been refined by several researchers in the fields of economic history and regional economics including North and Tiebout, (1956). It is easy to tell a convincing story about how a base industry works.

Imagine for instance that a rich oil field is discovered in the middle of frozen and unpopulated tundra. To develop the field requires labour in site. The labour demands a range of local services. This gives rise to local economic activity which with its own labour and income will generate further demand and so on (Hirschman, 1958). The length of this chain of induced economic activity obviously

depends on a range of economic, geographic and technical factors. However, with everything counted, it may easily amount to a significant multiple of the initial value-added in the oil industry. Thus, measured in the conventional way by its share in the GDP, the oil industry might not seem overwhelmingly important (Blumenfeld, 1955). The service industries, not to mention government services, might easily appear larger. However, the entire economy came into being as a result of the oil industry and it might well fold up completely without it. In this sense, the oil industry is a base industry of this economy (Homer, 1941).

However, the economic base theory became popular through the contribution of Homer (1941) and this theory has been improved upon by other scholars. Homer (1941) posited that "The economic base theory technique is based on a simple causal model that assumes that the basic sector is the prime cause of local economic growth, that, it is the economic base of the local economy".

2. Methods and Materials

Data Collection

Relevant data and information were extracted from government publications: The Federal Department of Fisheries Statistical Publications, Central Bank of Nigeria annual reports and Nigeria Bureau of Statistics annual reports. Such data include:

- National GDP between 1971 and 2009
- Total number of fishermen in Nigeria between 1971 and 2009
- Estimated Number of Fishing Crafts between 1971 and 2009
- Nigeria fish production- artisanal, aquaculture and Industrial between 1971 and 2009

Data Analysis

To establish long-run equilibrium relationship between National GDP and the fisheries sub-sector of the economy was analyzed using co-integration analysis. The first step is the unit root test and Philip Perron (PP) was used.

The PP test-statistic under the null-hypothesis is of I (0)

$$Z(t_{it}) = (\beta_{it}/\beta_{it}) t_{it} - 1/2 (\beta_{it}^2 - \beta_{it}^2) [t_{it}^2 - \sum_{i=2}^T (Y_i - Y_{i-1})^2] \quad (1)$$

Where $Z(t_{it})$ is $[Y \ L \ K \ F]$ of logarithmic transformations of these variables, and including up to k lags of $Z(t_{it})$;

Y : National GDP

L_t : Labour (Total number of fishermen in Nigeria)

K_t : Capital (Total fish craft used in fishing in Nigeria)

F_t : Total fish produced in Nigeria (i.e. Artisanal, Industrial and Aquaculture)

α : The coefficient of estimated unit root

α_k : The coefficient of estimated unit root considering the time lag

Y_t : Variable under consideration

Y_{t-k} : Variable under consideration considering the time lag.

Therefore, since the objective of this study is to establish a long-run equilibrium relationship between the gross domestic product (GDP) of Nigeria, the inputs of the primary factors of production; labour, capital and the output of the economic base — here, fisheries was achieved through the definition of a vector auto-regression (VAR) in the 4×1 vector. The long-run equilibrium relationship establishes the fact that the economic base activities (fisheries) contribute much more than it is captured in the National income.

The co-integration equation below was used to establish the long run equilibrium relationship among the variables;

$$Z(t_{it}) = A_1 + \dots + A_k + u_t \tag{2}$$

Where

K is 4×4 matrix, for $i = 1, \dots, k$, A is matrix

of coefficients relating to the 4 variables in $Z(t_{it})$ to their lagged values and u_t is the error term.

However, (equation 2) was reformulated into a vector error-correction model (VECM) form, as follows:

$$\Delta z_t = \alpha_1 \Delta z_{t-k} + \dots + \alpha_{k-1} \Delta z_{t-k+1} + \Pi z_{t-k} + u_t \tag{3}$$

where $\alpha_i = -(\mathbf{I} - \mathbf{A} - \dots - \mathbf{A}_i)$, $i = 1, \dots, k-1$, and $\Pi = -(\mathbf{I} - \mathbf{A} - \dots - \mathbf{A}_k)$ are all 4×4 matrices. This specification usefully separates the short-run and long-run adjustments to changes in the variables in z , capturing these in the matrices α_i and Π respectively. Therefore, a stable relationship between production and the utilization of primary factors of production usually labour and capital, has been a standard feature of empirical macroeconomics since the pioneering work of Paul Douglas, (Noel et al, 2006). Therefore, if a particular activity acts as an economic base, it must affect this relationship in a positive way.

In other words, production must depend, at least in the long run, on the size of the basic activity as well as the inputs of primary factors of production.

3. Results and discussion

Unit Root Test

This is to test the existence of unit root using Philip-Perron (i.e. PP) specification. The regression of a non-stationary time series on another non-stationary time series may produce spurious regression estimates. The summary of the unit root test at level and at difference presented in Table 1 confirmed that all the variables in the model are non-stationary; i.e. they all contained a unit root. Since the absolute value of their PP were greater than their critical values at levels both at 1% and 5% level of significance i.e. for GDP (-1) $-1.948928 > -3.632900$, -2.948404 of significance in absolute term. Also, for other variables i.e. F, K, L the unit root does exist at first difference. $D(F(-1)) -2.059762 > -3.639407$, -2.951125 , $D(K(-1)) -2.075418 > -3.639407$, -2.951125 and $D(L(-1)) -2.186406 > -3.639407$, -2.951125 .

Thus, the null hypothesis is rejected i.e. all the variables in the model (i.e. GDP, F, K, L) are non-stationary, therefore, there is not going to be spurious correlations among the variables. All the variables are stationary at first difference (i.e. I (1) and the co-integration tests were carried out.

Table 1. Summary of Unit Root Test at Levels And Differences

Variables	Phillip-Perron Test Equation T-Statistics	1% Critical	5% Critical
GDP (-1)	-1.948928	-3.632900	-2.948404
D(F(-1))	-2.059762	-3.639407	-2.951125
D(K(-1))	-2.075418	-3.639407	-2.951125
D(L(-1))	-2.186406	-3.639407	-2.951125

Co-integration Test

From the Table 2, the Trace Statistic test reveals that at both 1% and 5% level of significance that at most 3 and 2 equations are co-integrated, since their absolute values are greater than the critical values of 1% and 5% level of significant i.e. $151.6291 > 70.05$ and 62.99 , $62.39500 > 48.45$ and 42.44 .

Table 2. Summary of the Co-integration Test (Trace Statistic)

Hypothesized No. Of Ce (S)	Trace Statistic	1% Critical	5% Critical
At Most 3*	151.6291	70.05	62.99
At Most 2**	62.39500	48.45	42.44
At Most 1	15.74270	30.45	25.32
At Most 0	2.334533	16.26	12.25

*(**) denotes rejection of the hypothesis at the 5%(1%) level.

Also, from the Table 3, the Max-Eigen values reveal that at both 1% and 5% level of significance that at most 3 and 2 equations are co-integrated. Their absolute values are greater than the critical values of 1% and 5% level of significant i.e. $89.23411 > 36.65$ and $31.46, 46.65230 > 30.34$ and 25.54 . This corroborated the Trace Statistics. Therefore, it was concluded that there is a long run equilibrium relationship between the 4 identified variables (GDP, F, K, L) in the model. With all these tests, there is a long run equilibrium relationship between the dependable (GDP) and the explanatory variables (F, K and L) in the model.

The results established the fact that Fisheries Sector of Nigeria could be seen as an economic base of the coastal part of the country, in which the economy lives of the people living around the coastal area of the Country depends upon. Definitely, the contributions of the sector to the National Account of Nigeria were not totally captured, since there is long run equilibrium relationship among the number of people involved in fishing (i.e. fishermen), the National GDP, the Capital Stock involved in fishing and total fish produced. The number of people who are engaged in one activity or the other such as fish transporters, fish processors and marketers, are all employed by this sector and all are contributing to the National GDP. Such contributions may not have been traced to the fisheries sub-sector of the economy.

In addition, the Capital Stock that is used in fishing which includes all the fish crafts are produced by certain company and such company employed number of the work force within the population and equally contributes to the GDP which is not traced to the fisheries sub-sector. Such company came to existence to service the fisheries sector. If the sector collapsed, such company will equally pack up. Expansion or contraction of this sector (i.e. Fisheries) will affect the Sector's contribution to GDP than it is recorded in the National Account. While the boom of the Fisheries sector will have positive multiplier effect on the GDP.

Invariably, the long run relationship established among the variables means that increase in the fisheries sector activities through increase in total fish production will necessarily lead to increase in activities of other variable such as labour and capital stock and greater proportional increase in National GDP. For example increase in Total Fish Produced in Nigeria will definitely lead to increase in GDP and definitely the increase must have been as a result of increase in number of people involved in fishing (i.e. Labour) around that period and also, the capital stock (i.e. K) involved in the fishing activities during this period must equally increase as the case of Newfoundland Economy (Noel et al, 2006).

However, the effect of the increase or expansion in the total fish production will only be reflected in the GDP and its positive effects of job opportunity to the people living around the fishing environment will not be captured in the National Account neither will the socio-economic benefits to the people living in the coastal area be captured in the National Account nor will it be traced to the existence of fisheries sub-sector. Likewise, any reduction or contraction in total fish production will only be recorded to reduce the GDP without taking into cognizance its effect on job reduction on the part of the Fishermen (i.e. Labour). The number of people involved in fish marketing, processing and even fish transporters will equally be affected in the coastal area. Equally on the Capital Stock (i.e. K), such contraction will lead to unemployment for the staff of the company involved in both production and maintenance of fish craft and canoe used in fishing activities, more so, the economic lives of the people living in the coastal area will be affected negatively and this will have, health, economic and social effects. All these will not be captured nor traced to the sector in the National Account. According to economic based theory, most economic activities in the fishing area came to existence as a result of the fishing activities taking place in such area. Most fishing companies that came to existence in the coastal areas are there because of the fishing activities in that area and most of the commercial activities that sprang up in the coastal area came to be as a result of fishing activities in the area.

However, the economic impacts of such commercial activities are not vividly captured in the National Account as part of fisheries sector contribution to the National Account and this underestimated the contribution of Fisheries Sector to the GDP. Therefore, the importance of fisheries sub sector to the Nigeria economy via its contribution to the National GDP is highly underestimated. Investment in the sub-sector will definitely increase its contribution much more to the economy of Nigeria than it will be recorded in National Account.

This is also in line with the findings of Noel et al, (2006). In this work, it was discovered that fishing is an economy base in the Newfoundland. Since, fishing activity which was discovered as an economic base in Newfoundland affected the primary factors of production (i.e. Labour and Capital) in a positive way. In other words, fish productions depend, at least in the long run, on the size of the fishing activity as well as the inputs of primary factors of production.

Table 3: Summary of the Co-integration Test (Max-Eigen Statistic)

Hypothesized No. Of Ce (S)	Max-Eigen Statistic	1% Critical	5% Critical
At Most 3**	89.23411	36.65	31.46
At Most 2 **	46.65230	30.34	25.54
At Most 1	13.40817	23.65	18.96
At Most 0	2.334533	16.26	12.25

Source: Extracted from Appendix B

*(**) denotes rejection of the hypothesis at the 5%(1%) level

Max-Eigen value test indicates 4 co-integrating variable(s) at both 5% and 1% levels

Lags interval (in first differences): 1 to 1

4. Conclusion and Recommendation

The co-integration method was used to establish long run equilibrium relationship between National Gross Domestic Product, labour (i.e. Total number of fishermen), capital (i.e. All capital stock involved in fisheries) and total fish produced. The implication of the statistical analysis is that the size of the fisheries sector in Nigeria economy has an impact on the size of the economy, over and above its contribution to value added (which would be reflected in its employment of the primary factors of production). An effect of this nature is consistent with the role of fisheries as an economic base for the economy of Nigeria especially people living around the coastal region of the country.

Therefore, Fisheries sector should be giving the expected priority to contribute more to the economy at all level of government (i.e. Federal, State and Local) in Nigeria. Also, effort should be taken to forestall any contraction of the sector, because it is going to have more effect on National Account of the country. More so, effort should be made to encourage the fishermen at the coastal area of the country to boost their productivity, so that they will not abandon fishing. Since fishing is found to be an economy base in Nigeria.

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