CONCENTRATION AND CONDUCT OF TRAWL FISHERIES IN NIGERIA

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Abstract

This study examined the degree of concentration and conduct of trawl fisheries in Nigeria. A cross section of 60 vessels comprising fishing and shrimping vessels were surveyed. Gini Coefficient and Lorenz curve were used to determine the degree of industry concentration. Results from the study show a Gini Coefficient value of 0.436 for fishing vessels and 0.44 for shrimping vessels showing that trawl fishing and shrimping is unconcentrated. The study further observed the absence of those practices limiting competition like collusive pricing, exclusionary tactics against non- members and restrictive regulations barring entry despite their membership of a cartel (Nigerian Trawler Owners Association [NITOA]). The behavioural pattern exhibited by participants provided the necessary atmosphere for competition to thrive and this could have reflected in the level of performance of the vessels. The study recommends that NITOA should maintain the present status quo. Federal Department of Fisheries (FDF) should closely monitor their activities to ensure they do not adopt any practice or go into any agreements likely to diminish competition in the future.

Keywords: Gini Coefficient, Lorenz curve, Fishing, Shrimping, Vessels.

Introduction

An important variable in industrial structure analysis is concentration which depicts a situation in which a few large firms have the largest share of the business. According to

Friedman (1953), inequality of earnings is partially a reflection of differences in the riskiness of investment. Assuming that there is a positive correlation between the level of profits and sales on the one hand and the magnitude of risks on the other, and since people differ in their risk preferences, then those with a higher propensity to take risks tend to choose more risky ventures and consequently, could have larger earnings and make more profits. As against this, people with a relatively higher degree of risk aversion seem to prefer less risky and less profitable investments and consequently obtain lower earnings. By taking greater risks, enterprising distributors find themselves in a position where they can increase sales revenue and profits. This strengthens their market power and engenders concentration. Furthermore, this aversion to risk tends to limit the number of entrants into the trade (Okereke and Anthonio 1988).

Higher seller concentration in an industry is generally associated with poor market performance. For instance, price increases and excess profits tend to result where the largest eight sellers supply from two thirds to three quarters of the output of an industry (Bain, 1968). On the other hand, in industries where seller concentration is moderate so that the largest eight sellers supply less than two thirds of industry output, there is on the average, a disposition towards lower profits and a much closer approximation to a competitive price-cost output adjustment.

Economic growth tends to promote concentration as it prompts firms to increase in size in order to enlarge their market power. Large firms, in general have more opportunities to introduce technological innovations than smaller ones. That being the case, it would seem that concentration would tend to eliminate uneconomic units and provide for more rational resource allocation.

Attempts to curb concentration may take two forms. One is the exercise of political power by small firms through legislation or other statutory measures to resist the power of the large firms and to encourage and protect the smaller ones (Okereke and Anthonio 1988).

Industrial conduct is the pattern of behaviour which firms follow in adapting or adjusting to the environment in which they sell or buy (Bain, 1958). In particular, they are methods employed to determine price, sales promotion, and co-ordination policies and the extent of predatory or exclusionary tactics directed against established rivals or potential entrants (Abbot, 1993). Industrial conduct is heavily influenced by industrial structure or degree of industry concentration. It is the link between industrial structure and performance. This is because the behaviour of firms in an industry can adversely affect the efficiency of the entire system (Olukosi and Isitor, 1990). Kalio (1987) and Effiong (1996) in their study of the marketing of some agricultural products in Rivers and Akwa Ibom States discovered that middlemen constituted themselves into traders associations with consequent adoption of exclusionary tactics against non-members. Ladipo (1974) reports that some firms send people (spies) to collect price information from other firms. If they find that prices at which others are offering their products are lower than theirs, they reduce their own price in order to retain their customers.

Although some studies have been conducted on the cost structure, earning capacity and performance of trawling vessels such as Effiong et al (2016a), Effiong and Eke (2016) and Effiong et al (2016b) little is known empirically regarding the structure and conduct of industrial trawl fisheries and its implication for performance. Considering the huge investment in trawl fisheries, keen interest is taken in its structure and conduct. The structure conduct and performance of trawlers have great implications for the economy as a whole as it

could affect foreign exchange earnings, employment generation and as source of food and income. This study examines the degree of concentration (structure) and conduct of industrial trawl fisheries. Results of the study are expected to facilitate meaningful policy investment guidelines which could enhance the performance of trawlers, stimulate increased investment in the sector and hence make possible the realization of the objective of national fisheries policy.

Methodology

A two stage sampling procedure was used in selecting the sample for the study. First, the list of licensed vessels operating in Nigeria was obtained from the Federal Department of Fisheries (FDF) from which 60 vessels were randomly selected. The second stage involved stratified sampling where the vessels were classified into large and small vessels. The third stage involved the random selection of 30 fishing and 30 shrimping vessels.

Relevant information for this study was gathered through a combination of personal informal interviews, discussions and interview with a questionnaire on Nigerian flagged and foreign flagged registered trawling vessels. Secondary data for the study was obtained from Federal Department of Fisheries (FDF), Nigerian Trawler Owners Association (NITOA) and Nigerian Maritime Administration and Safety Agency (NIMASA).

Study Area

The study area is located within Nigeria's territorial (marine) waters and the Exclusive Economic Zone (EEZ)- the operational base of trawling vessels. Nigeria has territorial marine waters of thirty (30) nautical miles which came into operation in 1967. The EEZ extends from the extreme limits of the territorial waters of Nigeria up to a distance of 200 nautical miles from the baseline from which the breadth of the territorial waters of Nigeria is measured. Nigeria has a coastline of about 853 kilometres bordering the Gulf of Guinea in the Atlantic Ocean. It also has territorial (fresh) waters in Lake Chad. Most of the vessels have their operational base at Apapa port where they berth.

Analytical Technique

The Gini coefficient and Lorenz curve was used to determine the degree of industry concentration. The total value of sales revenue from trawling operations was obtained from a sample of 60 trawlers as an index of measurement. In carrying out this portion of analysis it is assumed in this study that each trawler is taken as a firm.

Lorenz curve was obtained by plotting the cumulative percentage of each category of trawlers arranged in order, from the smallest number to the largest, against the cumulative percentage of their sales earnings. The extent to which the Lorenz curve deviated from the diagonal line is an indicator of relative concentration as the area between the Lorenz curve and line of equal distribution (OP) is usually termed the area of concentration (Morgan, 1965 and Needham, 1977). The degree of inequality in sales revenue was estimated by reading the curve at the point where it lies farthest from the OP. The Gini Coefficient is a more precise measure for measuring inequality of incomes and it represents the proportion of the area under the diagonal (line of equal distribution) which lies between the diagonal and the Lorenz curve. Computation was done by finding the sum of the product of the percentage of the trawlers and the cumulative percentage of their sales revenue and subtracting it from 1. The difference represented the Gini Coefficient and it ranges from 0 to 1. A Gini Coefficient of 0 implies perfect equality in distribution while a coefficient of 1 means perfect inequality. In

practice, the actual value of the Gini coefficient lies between these 2 extremes. The closer the value is to unity, the greater is the degree of inequality and therefore the higher is the level of concentration and vice versa.

Results and Discussion
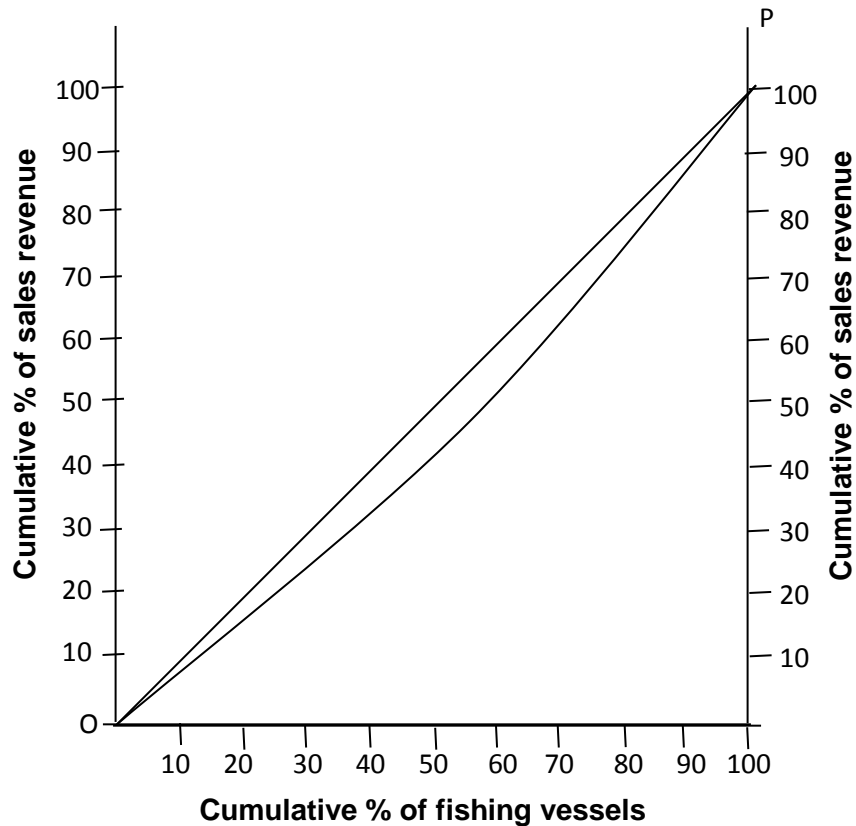**Concentration of Trawling Vessels**

Fishing Vessels

Table 1 : Distribution of Fishing Vessels By Size of Annual Sales Revenue

Sales range (₦)	Frequency	Relative Frequency (X)	Cumulative Frequency	Total value Of annual sales	Relative frequency Of total sales	Cumulative frequency Of total sales (Y)	XY
85000001-91000000	8	0.27	0.27	690000000	0.234	0.234	0.063
91000001-97000000	7	0.23	0.50	660000000	0.224	0.458	0.105
97000001-103000000	5	0.17	0.67	500000000	0.170	0.628	0.106
103000001-109000000	5	0.17	0.84	540000000	0.183	0.811	0.138
109000001-115000000	3	0.10	0.94	329000000	0.112	0.923	0.092
115000001-121000000	2	0.06	1.00	230000000	0.078	1.000	0.060
Total	**30**	**1.00**		**2949000000**	**1.000**		**0.564**

Mean Value of Sales = N98300000

Gini Coefficient   = 1 – 0.564

                   = 0.436

Source: Survey Data, 2015

Source: Computed from table 1

Figure 2: Lorenz Curve Showing Distribution of Fishing Vessels by Size of Average Sales

Table 1 illustrates the observed level of concentration of fishing vessels operating in Nigeria. Out of the total 30 fishing trawlers, 8 (27 per cent) obtained sales revenue of between N85000001 – N91000000 with total sales of 690000000; 7 (23.3 per cent) obtained sales revenue of between N91000001 –N97000000 with total sales revenue of N660000000; 5 (17 per cent) obtained sales revenue of between N97000001 – N103000000 with total sales revenue of N500000000; 5 (17 per cent) obtained sales revenue of between N103000001 – N109000000 with total sales of N540000000. 3 (10 per cent) obtained sales revenue of between N109000001 – N115000000 with total sales revenue of N329000000; while the remaining 2 (6 per cent) obtained sales revenue of between N115000001 – N121000001. Figure 1 illustrates the observed level of concentration of fishing vessels operating in Nigeria. The Lorenz curve at its furthest point from the line of equal distribution shows that 67 per cent of fishing trawlers account for 62 per cent total sales so that the rest 33 per cent of fishing vessels are responsible for 38 per cent of total volume of sales. These results show that the market for fishing vessels is unconcentrated (competitive in structure). This fact is further confirmed with a Gini Coefficient of 0.43. The relative ease of entry, unchecked activities of illegal fishing by foreign vessels and absence of exclusionary tactics against non-NITOA members may be the major factors responsible for the competitive structure of fishing vessels. These factors working together may have made it impossible for some vessels to use price reduction techniques to increase sales and hence their economic power which could have induced concentration. There is no evidence that vessels are

able to exploit inefficiencies in the system to increase their market share. Effiong et al (2016b) obtained 0.44 as economic performance (Ep) values for fishing trawlers, implying that fishing vessels retain only 44 per cent of their total earnings as net profit. This phenomenon could be attributed to the competitive structure of industrial trawl fishing.

Shrimping Vessels

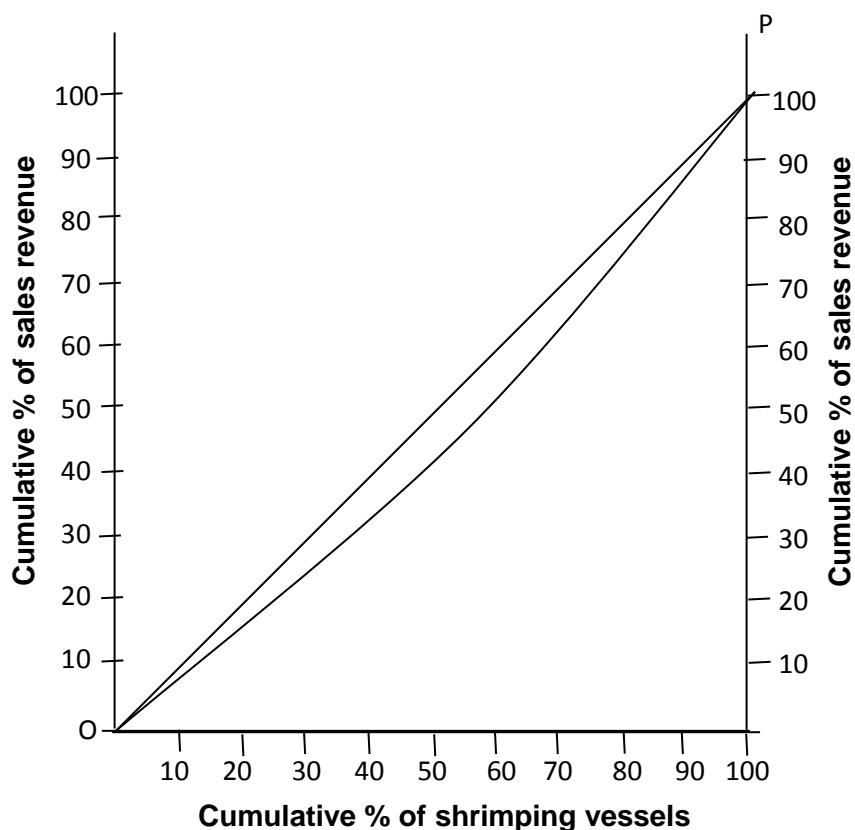**Table 2 : Distribution of Shrimping Vessels by Size of Annual Sales Revenue**

Sales range (₦)	Frequency	Relative Frequency (X)	Cumulative Frequency	Total value Of annual sales	Relative frequency Of total sales	Cumulative frequency Of total sales (Y)	XY
95000001-102000000	7	0.23	0.23	678000000	0.200	0.200	0.046
102000001-109000000	5	0.17	0.40	560000000	0.165	0.365	0.062
109000001-1160000000	6	0.20	0.60	658000000	0.194	0.559	0.111
1160000001-123000000	5	0.17	0.77	585000000	0.173	0.732	0.124
123000001-130000000	5	0.17	0.94	628000000	0.185	0.917	0.156
130000001-137000000	2	0.07	1.00	282000000	0.083	1.000	0.070
Total	**3.0**	**1.00**		**3391000000**	**1.00**		**0.569**

Mean Value of Sales = N113033333.3

Gini Coefficient = 1 – 0.569

= 0.44

Source: Survey Data, 2015

Source: Computed from Table 2

Figure 2: Lorenz Curve Showing Distribution of Shrimping Vessels by Size of Average Sales

Table 2 shows the observed level of concentration of shrimping vessels operating in Nigeria. Out of the total 30 shrimping vessels, 7 (23 per cent) obtained sales revenue of between N95000001 – N102000000 with total sales revenue of N678000000; 5 (17 per cent) obtained sales revenue of between N102000001 - N109000000 with total sales revenue at N560000000; 6 obtained sales revenue of between N109000001 – N116000000 with total sales revenue at N658000000; 5 (17 per cent) obtained sales revenue of between N123000001 – N130000000 with total sales revenue at N585000000; 5 (17 per cent) obtained sales revenue of between N123000001 – N130000000 with total sales revenue of N620000000; while the remaining 2 (7 per cent) obtained sales revenue of between N130000001 – N137000000 with total sales revenue at N282000000. Figure 2 shows the observed level of concentration of shrimping vessels operating in Nigeria. The Lorenz curve at its furthest point from line of equal distribution shows that 64 per cent of shrimping vessels accounted for 60 per cent of total sales so that the rest 36 per cent of shrimping vessels are responsible for 40 per cent of total volume of sales. These results show that the market structure for shrimping vessels is unconcentrated (competitive in structure). This fact is further confirmed with a Gini Coefficient of 0.44. Factors which may be responsible for the competitive structure of shrimping vessels is as outlined for fishing vessels. Bain (1968) contends that in industries where seller concentration is moderate or less, so that the largest eight sellers supply less than two thirds of industry output, there is on the average, a disposition

towards lower profits and a much closer approximation to a competitive price-cost output adjustment. This may have accounted for the level of performance observed among some vessels in this study. Economic performance (Ep) values for shrimping vessels as obtained by Effiong et al (2016b) is 0.53, implying that vessels retain 53 per cent of their total earnings as net profit. The competitive structure could have accounted for this observed level of performance among shrimping vessels

Industrial Conduct of Trawling Firms

The behaviour of participants within the industrial fishery sub-sector, what decisions they make, and how they react in different situations is used to describe their conduct. Table 3 shows the distribution of trawling firms according to Industrial Conduct. 86 percent of Trawling Firms were members of NITOA. As a cartel, they exist to protect the common interest of members and parley with government in the formulation of policies affecting the industrial fishery sub-sector. They also collaborate with relevant stakeholders in the industry to ensure a conducive environment for their activities. Membership is not compulsory but non-members may not benefit from any incentive package from government. 91.7 percent indicated that they do not practice collusive pricing nor any other agreement likely to diminish competition, implying that the prices at which their products is sold is dictated by the prevailing domestic market/international market price (in case of shrimps which are exported). 95% of the respondents do not adopt exclusionary tactics against non-members of NITOA. The corollary is that non-NITOA members, unregistered and unlicensed vessels/poachers can operate side by side within Nigeria's territorial waters if not checkmated by the relevant governmental agency. They can however report the activities of illegal fishing to the relevant agency for action. 75 percent of the firms indicated the absence of restrictive regulations barring entry by NITOA, thus implying that there is free entry and exit for new entrants that meet the minimum requirements stipulated by Federal Department of Fisheries in the Sea Fisheries Act of 1971, Sea Licensing Regulations of 1971, Sea Fisheries Regulations of 1972 and Exclusive Economic Zone Act of 1978. This finding underscores the need for would-be investors to take advantage of the prevailing circumstances and invest massively in industrial trawl fisheries.

Table 3: Percentage Distribution of Trawling Firms according to Industrial Conduct

Conduct of Firms	Existent(%)	Not Existent (%)
Membership of cartel (NITOA)	52 (86.7%)	8 (13.3%)
Collusive pricing	5 (8.33%)	55 (91.7%)
Exclusionary tactics against non-members	3 (5%)	57 (95%)
Existence of restrictive regulations barring entry	15 (25%)	45 (75%)

Survey Data, 2015

Conclusion and Recommendations

Industrial trawl fisheries in this study are observed to be unconcentrated. As there is no evidence that vessels are able to exploit inefficiencies in the system to increase their market share. The competitive structure could have accounted for modest levels of economic performance obtained for fishing (Ep 0.44) and shrimping vessels (Ep 0.53). The conduct exhibited by trawler firms as observed in this study which allowed free entry and exit is typical and approximates that it is necessary for competitiveness which could have accounted for the levels of performance of vessels.

NITOA should maintain the present status quo. However, they should be closely monitored by FDF to ensure they do not adopt any practice or go into any agreements likely to diminish competition in the future.

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