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Market structure and conduct: A performance check on edible oil markets in the Niger delta region of Nigeria

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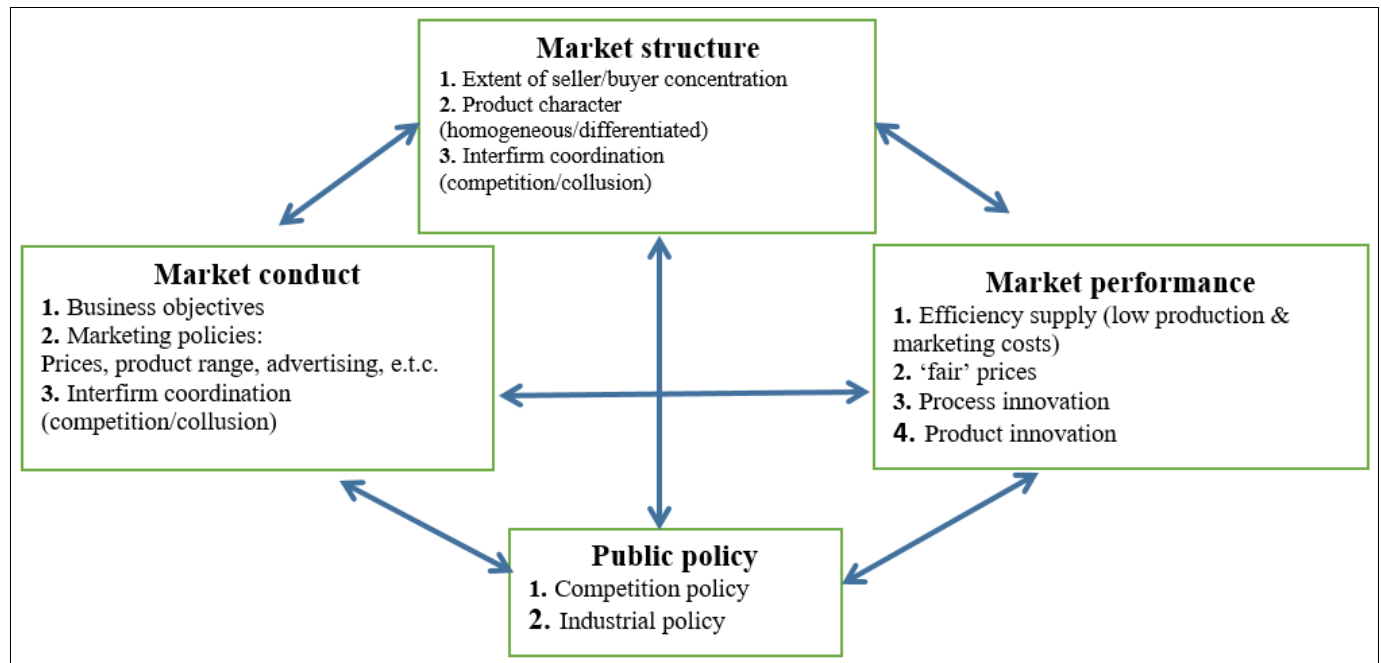**DOI:** https://doi.org/10.33545/26633329.2023.v5.i1a.116

Abstract
Edible oil is a leading agribusiness enterprise in Nigeria. Much is known about its production and nutritional value but little is known about the functionality of the markets' systems. The paper analysed effects of structure, conduct on performance of edible oil (palm and vegetable oils) markets using primary data generated through questionnaires administered by trained enumerators. A multistage sampling technique was used to select 432 edible oil marketers from 36 markets in 3 States of the Niger Delta. To ascertain the structure-conduct-performance viewpoint, the use of ordinary least square regression technique was implored to analyse the data generated from the respondents. The results portrayed that some parameters of structure (product innovation, fair prices, product homogeneity) were positive predictors of performance, while conduct (collusion) negatively affected the performance. The values of R^2 (0.724 and 0.612), Adjusted R^2 (0.697 and 0.578) and F statistics (F=14.747 and 5.206: $p<0.01$) showed that market structure and conduct respectively, had statistically significant effect on performance of edible oil markets. The study recommends policy interventions on edible oils markets such as product innovations, product homogeneity should be encouraged while market collusion be discouraged by both government and stakeholders. This would improve performance of the edible oil agribusiness and sustainability of stakeholders' livelihoods.

Keywords: Agribusiness, conduct, edible oil, performance, product innovation, structure

Introduction
Food loss and wastage is a major challenge facing agriculture in the world today (Wang *et al*, 2021) [23]. Africa is not exempted from the challenge. Farmers and agro-processing companies are seeking ways to ensure that their crops and produce are profitably and efficiently disposed of to avoid edible oil loss and wastage. Edible oil is one of the many farm produce in Nigeria. Particularly the Niger Delta. Agro-processors and farmers are seeking ways to improve the market for edible oil in Nigeria. Edible oils are oils sourced from agricultural plants which can be domestically consumed or industrially utilized. There is palm oil which is reddish in color, sourced from the oil palm; and the vegetable oils which is rather colorless and is sourced from a variety of vegetables such as soybean, groundnut, olive, coconut, carrot, avocado and others (Statista, 2022) [19]. Palm oil is currently the second largest traded edible oil next to soybean vegetable oil and accounts for about one quarter of the world's fats and oil supply (Statista, 2022) [19]. The bulk of palm oil that is produced goes into food applications; hence its nutritional properties have been extensively studied. There are also very few studies on edible oil markets and there are scant studies on the effect of structure and conduct on edible oil markets' performance. The performance of any market is highly dependent on how effectively and efficiently the market functions with regards to all participants.

Market Structure according to Kretschmer *et al.* (2022) [13] refers to those organizational characteristics of a market that exercises strategic control on the nature of competition and behaviour within the markets. Groening *et al.* (2018) [8] also classifies these characteristics into two main groups namely; Intrinsic (dictated by the idea of items, accessibility of production and marketing advances) and derived (determined by firms and governments examples, barriers of entry, seller and buyer concentration and product differentiation) structural variables.

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Source: Authors own concept, 2022

Fig 1: Conceptual Framework of Market Structure, Conduct and Performance

Market Conduct refers to the price and other market policies which are sought after by stakeholders and the manner by which they coordinate their choices (Chen *et al*. 2019) [5]. For example, in an environment where there are many buyers and sellers, the market tends to determine the price. This means that households buy food commodities and agricultural inputs at prices that equal the costs of producing the last unit of the commodities (Marginal cost). In contrast, if there are only a few sellers of food commodities in a market, these few traders can conspire and charge consumers higher prices, up to the level where consumers can opt to buy from nearby markets at a lower cost. Also, firms in highly concentrated market may decide to collude and fix or raise prices in order to make more profits and wade off competition from new entrants into the market (Jaspers, 2019) [11]. Market conduct is heavily influenced by the market structure and it is also the link between structure and performance.

Market performance is the ultimate impact of the market to its participants in terms of pricing, volumes traded and marketing costs. Profitability is utilized as an intermediary to evaluate the performance of a market and to test the two theories in the Structure-Conduct-Performance (SCP) worldview; regardless of whether profits are accumulated as a result of effectiveness of the organizations (Conduct-performance hypothesis) or as a result of market concentration (Structure-performance hypothesis) (Bobola *et al*. 2015; Bekele 2018) [3, 2]. The degree of profit generated depends mostly on how effectively the market for a commodity works (Mafimisebi, 2012) [24]. Therefore, performance means how well the market fulfills the necessities of all the market participants.

Tien *et al.* (2019) [22] defined marketing as the performance of business activities that directs the flow of goods and services from producers to consumers. Furthermore, marketing ensures that seasonal goods especially in agriculture are available throughout the year with slight fluctuations in price (Gu and Wang, 2020) [9].

Edible oil in the Niger Delta is an all year round agribusiness, so there is need to understand how well the markets function and flourishes. Arising from this, the study is guided by this research question: Is there any causal relationship between market structure or conduct and the performance of edible oil marketing? Therefore, the objective of this paper is to ascertain the effect of market structure and conduct on edible oil (vegetable oil and palm oil) market performance in Niger Delta Nigeria. This was guided by the Hypotheses that: There is no significant effect of market structure and market conduct on performance of edible oil markets.

The most generally utilized variable to evaluate the performance of a market is the marketing productivity. According to Nihamoni (2020), there are different approaches to the analysis of marketing systems, some of which are functional and behavioral systems approach. The Structure-Conduct-Performance (SCP) paradigm is a tool used to analyze markets in order to establish the relationship between market structure, market conduct and the market performance and then relate it to policy interventions (Figure 1). According to Khan and Hanif (2019) [12], the major proponents of the SCP Model are Bain (1968) [1], Shaffer (1980) [18] and Marion (1986) [15]. Bucket theory illustrates marketing as a one-way communication consisting of advertising and promotions, where the hypothetical 'bucket' is filled with consumers as a result of the traditional marketing efforts of attracting new customers. Although the bucket often suffers either small or large "holes' which allows consumers to disappear in varying frequency, Relationship marketing is used to mend these holes in order to keep old customers. In the case of edible oil, some marketers are interested in attracting new customers and keeping old ones by providing them with fresh and unadulterated edible oil.

Source: Authors field capturing, 2022

Plate 1: Edible oil: (a) palm oil; (b) vegetable oil.

Materials and Methods

Niger-Delta is the study area; it was chosen for this study because it is the hub of oil industry in Nigeria. It is the delta of the Niger River and it sits legitimately on the Gulf of Guinea on the Atlantic Ocean in Nigeria. It incorporates the six States of the South geopolitical zone, Ondo State from South West then Abia and Imo States from South East, geopolitical zones. All Niger Delta States are crude oil-producing except Cross river. Niger Delta is a thickly populated locale sometimes called the Oil Rivers since it was a major producer of palm oil. The territory was known as British Oil Rivers Protectorate between 1885 and 1893, before it became expanded then turned into Niger Coast Protectorate. Niger-Delta is an oil rich locale, and has been the focal point of worldwide debate over contamination. The Niger-Delta reaches out over about 70,000 km^2 (27,000 sqm) which makes up about 7.5% of Nigeria's land mass and is inhabited by 31 million people, (NPC, 2018).

Methods of Data Analysis

The objective of this study as well as testing of the hypothesis were achieved through the use of Ordinary Least Squares Regression (OLS). This follows the work of Hackl, Kummer, Winter-Ebmer and Zulehner (2014) [10], on Market Structure and Performance in E-Commerce. The Performance (Net return on investment) of the edible oils was regressed against market concentration values, product homogeneity, product innovation and 'fair' prices. The model is specified implicitly as:

$$NROI = f(S/BC + PH + PI + FP + ei)$$

This is explicitly specified as:

$$NROI = \beta_0 + \beta_1 S/BC + \beta_2 PH + \beta_3 PI + \beta_4 FP + ei$$

Where
NROI = Net Return on Investment
S/BC = Seller/Buyer Concentration
PH = Product Homogeneity (4 point likert type scale)
PI = Product Innovation (4 point likert type scale)
FP = Fair Prices (Dummy: yes 1, otherwise 0)

ei = error term
B$_1$ – B$_4$ = Parameter to be estimated
Again, the Performance (Net return on investment) of the edible oils was regressed against collusion, product innovation and fair prices or otherwise. The model is specified as;

$$NROI = \beta_0 + \beta_1 Co + \beta_2 PI + \beta_3 FP + ei$$

Where
NROI = Net Return on Investment
Co = Collusion
PI = Product Innovation (4 point likert-type scale)
FP = Fair Prices (Dummy: yes 1, otherwise 0)
ei = error term
The results of the regression analysis were based on the standard statistical and econometric criteria such as the values of F-statistic, Durbin-Watson statistic, coefficient of multiple determination (R^2) and *apriori* expectations of signs and magnitudes of the regression coefficients.

Results and Discussion
Effects of market structure on the performance of edible oil markets in Niger Delta
Vegetable Oil

The analysis on vegetable oil market performance in Niger Delta (Table 1) revealed that the coefficient of multiple determination (R^2) was 0.724, this showed the extent to which the market structure predicted the performance of the vegetable oil market at 72%. The Adjusted R^2 (0.697) showed that 70% of the variance in the performance of vegetable oil market was accounted for by the market structure. Also, it was observed that the coefficient of multiple determination (R^2) of Rivers State (0.684) and Delta State (0.555) recorded the highest and least values. These results showed the extent to which the market structure predicted vegetable oil market performance at 55%, 68% and 68% in Delta, Edo and Rivers States respectively. The Adjusted R^2 of 0.529, 0.646 and 0.652 for Delta, Edo and Rivers states showed that 53%, 65% and 65% of the variance in the vegetable oil market performance was accounted for by the market structure.

Results on product innovation (β =0.712: $p<0.05$) in Delta state was statistically significant at 5% probability level with a positive Beta coefficient value and so was a positive predictor of performance. The implication of this result is that a 1% increase in product innovation will increase the vegetable oil market performance by 0.712%.

Fair Prices (β =0.373 and 0.597: $p<0.05$) in Delta and Rivers states was statistically significant at 5% probability level. The Beta coefficient showed that fair prices was a positive predictor of performance in the States, which implies that a 1% increase in fair prices will increase the vegetable oil market performance by 0.373% and 0.597% respectively.

Product homogeneity results (β=0.543 and 0.513: $p<0.05$) in Edo and Rivers states were statistically significant at 5% probability level. The positive value of the Beta coefficient showed that product homogeneity was a positive predictor on the performance of vegetable oil market in the states. This implies that a 1% increase in product homogeneity will

increase the performance of the vegetable oil market by 0.543% and 0.513% respectively. Also, the seller/buyer concentration result (β=0.525: $p<0.05$) was statistically significant at 5% probability level and was a positive predictor on the performance of vegetable oil market in Edo state. The implication is that a 1% increase in seller/buyer concentration will increase the vegetable oil market performance in Edo state by 0.525%.

In the entire Niger Delta area, the F-statistic (F=14.747: $p<0.01$) indicated that market structure had a statistically significant effect on vegetable oil market performance at 1% level of probability. Therefore, the null hypothesis which stated that market structure has no significant effect on the performance of vegetable oil market is hereby rejected. These findings are in line with the findings of DJULIUS *et al.*, (2021) [7] whose study revealed that seller/buyer concentration ratio and innovations had significant effects on the performance of the creative industry in Indonesia.

Table 1: Effects of Market Structure on the Performance of Vegetable Oil Market in Niger Delta

Variables	Niger Delta	Delta State	Edo State	Rivers State
Constant	0.1575	-0.4245***	0.5246**	0.5758**
	(0.1701)	(-3.4096)	(2.2592)	(2.2598)
Product Homogeneity	0.3556***	0.3569	0.5425**	0.5125**
	(3.0814)	(1.0730)	(2.2079)	(2.1134)
Product Innovation	-0.6400	0.7124**	0.3544	0.1758
	(-0.8859)	(2.7959)	(0.1502)	(0.2678)
Fair Prices	0.6142***	0.3725**	-0.0124	0.5965**
	(5.0179)	(2.8113)	(-0.3397)	(2.4131)
Seller/Buyer Concentration	-0.8246	-0.1254	0.5246**	-0.1124
	(-1.7338)	(-1.1146)	(2.2592)	(-1.1228)
Diagnostic statistics				
R^2	0.7235	0.5545	0.6755	0.6842
Adjusted R^2	0.6966	0.5285	0.6458	0.6522
F-statistic	14.7474***	10.712***	11.2841***	11.7010***

Note *** = significant at 1%; ** = significant at 5%; T value in Parenthesis

Palm Oil

The analysis on the performance of palm oil market in the Niger Delta (Table 2) revealed that the coefficient of multiple determination (R^2) was 0.775, showed the extent to which the market structure predicted its performance at 78%. The Adjusted R^2 (0.752) showed that 75% of the variance in the palm oil market performance was accounted for by the market structure. On further analysis, the coefficient of multiple determination (R^2) value of Rivers>Edo>Delta States respectively. These results revealed the extent to which the market structure predicted the palm oil market performance at 45%, 60% and 71% in Delta, Edo and Rivers States respectively. The adjusted R^2 (0.408, 0.572 and 0.682) for Delta, Edo and Rivers States showed that 41%, 57% and 68% of the variance in the performance of palm oil market was accounted for by the its structure.

The product innovation results (β =0.346 and 0.310: $p<0.05$) in Edo and Rivers states was statistically significant at 5% probability level with a positive Beta coefficient value indicating a positive predictor of performance. The implication of this result is that a 1% increase in product innovation will increase the palm oil market performance by 0.346% and 0.310% respectively in the States.

Product homogeneity results documented (β=0.311: $p<0.05$) in Delta state was statistically significant at 5% probability level. The positive value of the Beta coefficient showed that product homogeneity was a positive predictor of palm oil market performance in Delta state. This implies that a 1% increase in product homogeneity will increase the palm oil market performance by 0.311%.

Also, results on seller/buyer concentration (β=0.822 and 0.870: $p<0.01$) was statistically significant at 1% probability level and was a positive predictor on the market performance in Edo and Rivers states. The implication is that a 1% increase in seller/buyer concentration will increase the market performance by 0.822% and 0.870% respectively.

In the Niger Delta area, the F-statistic (F=12.745: $p<0.01$) indicated that market structure had a statistically significant effect on palm oil market performance at 1% level of probability. Therefore, the null hypothesis which stated that market Structure has no significant effect on the performance of palm oil market is hereby rejected. These findings support the findings of Erlinda *et al.* (2008) [25] who stated that structure had a statistically significant effects on performance in palm cooking oil industry in Indonesia.

Table 2: Effects of Market Structure on Palm Oil Market Performance in Niger Delta

Variables	Niger Delta	Delta State	Edo State	Rivers State
Constant	0.6105***	0.1125	0.5458***	0.5785**
	(4.1958)	(0.7721)	(3.8985)	(2.3535)
Product Homogeneity	0.2256	0.3111**	0.1458	0.1224
	(0.6524)	(2.7653)	(0.7286)	(0.5679)
Product Innovation	0.1001	-0.5021	0.3458**	0.3101**
	(0.3204)	(-0.6157)	(2.8045)	(2.7539)
Fair Prices	0.2461	0.5563	-0.2145	-0.2458
	(0.5967)	(1.9937)	(-0.5163)	(-0.5553)
Seller/Buyer Concentration	0.7788***	-0.7044	0.8223***	0.8695***
	(5.2444)	(-1.6640)	(7.1256)	(7.0519)
Diagnostic statistics				
R^2	0.7752	O.4454	0.6045	0.7142
Adjusted R^2	0.7521	0.4082	0.5723	0.6822
F-statistic	12.7451***	5.6582***	9.7322***	10.1124***

Note *** = significant at 1%; ** = significant at 5%; T value in Parenthesis

Effects of Market Conduct on Edible Oil Market Performance in Niger Delta

The analysis on the performance of vegetable oil market in the Niger Delta showed that the coefficient of multiple determination (R^2) was 0.562, which showed the extent to which the market conduct predicts the profitability of vegetable oil market was 56% (Table 3). The Adjusted R^2 0.528 which implied that 53% of the variance in the vegetable oil market performance was accounted for by the market conduct. As observed from the table, the coefficient of multiple determination (R^2) of Delta, Edo, and River States were 0.629, 0.678 and 0.554 respectively. This revealed the extent to which the market conduct predicts it performance at 63%, 68% and 55% respectively. The adjusted R^2 values 0.581, 0.636 and 0.515 for Delta, Edo and Rivers States implied that at 58%, 64% and 51% of the variance in the vegetable oil market performance was accounted for by the market conduct.

The collusion result was statistically significant at 5% and 1% probability levels in Delta (β= -0.924: $p<0.05$) and Rivers (β= -0.455: $p<0.01$) states respectively. The negative Beta coefficient indicates that collusion was a negative predictor of vegetable oil market performance in these States. The implication of this result is that a 1% increase in collusion will decrease the vegetable oil market performance by 0.924% and 0.455% in Delta and Rivers States respectively.

On product innovation, showed statistically significant at 1% probability level (β=0.424: $p<0.01$) which is an indication that product innovation is a positive predictor of vegetable oil market performance in Edo State. This implies that a 1% increase in product innovation increased the vegetable oil market performance in Edo state by 0.424%. The result showed that fair prices (β=0.749: $p<0.05$) was statistically significant at 5% probability level in Rivers state with a positive Beta coefficient value which implies that a 1% increase in fair prices increases the vegetable oil market performance by 0.749%.

On the Niger Delta analysis, the F-statistic (F=5.982, $p<0.01$) indicated that market conduct had a statistically significant effect (negative and positive parameters) on the vegetable oil market performance at 1% level of probability. Eleni (2001) also noted that the common conducts of the markets he identified in vegetable oil marketing were collusion through formation of association. Therefore, the null hypothesis which stated that market conduct has no

significant effect on the performance of edible oil market is hereby rejected. These findings are in line with the findings of DJULIUS *et al.* (2021) [7] whose study revealed that conduct had significant effects on the performance of the creative industry in Indonesia.

Table 3: Effects of Market Conduct on Vegetable Oil Market Performance in Niger Delta

Variables	Niger Delta	Delta State	Edo State	Rivers State
Constant	0.2896**	-0.5457***	0.8789***	0.5477***
	(2.0055)	(-3.7530)	(7.8124)	5.5843
Collusion	-0.3657	-0.9244**	0.1866	-0.4551***
	(-0.7105)	(-2.9392)	(0.3420)	(-3.1582)
Product Innovation	0.7827***	0.2155	0.4235***	-0.1547
	(3.1855)	(1.0051)	(3.6986)	(-0.4751)
Fair Prices	0.2107	0.1423	5.7902	0.7487**
	(1.8778)	(0.4557)	(0.7251)	(2.4151)
Diagnostic statistics				
R^2	0.5621	0.6298	0.6782	0.5538
Adjusted R^2	0.5276	0.5806	0.6362	0.5146
F-statistic	5.9821***	7.1671***	7.9854***	5.3572***

Note *** = significant at 1%; ** = significant at 5%; T value in Parenthesis

Palm Oil

The analysis on market conduct on palm oil market performance in the Niger Delta revealed that the coefficient of multiple determination (R^2) was 0.612 which implied the extent to which the market conduct influences the palm oil market performance at 61% (Table 4). The Adjusted R^2 value 0.578 showed that 58% of the variance in the palm oil market performance was accounted for by the market conduct. Also, the coefficient of multiple determination (R^2) values of Delta, Edo and River states were 0.657, 0.701 and 0.822 respectively. This result showed the extent to which the market conduct predicts palm oil market performance at 66%, 70% and 82% in Delta, Edo and Rivers State respectively. The adjusted R^2 values of 0.603, 0.673 and 0.781 for Delta, Edo and Rivers State revealed that 60%, 67% and 78% of the variance in the palm oil market performance was accounted for by the market conduct.

Also, collusion was statistically significant at 1% probability level in Delta (β= -0.686: $p<0.01$) and Rivers (β=-0.746: $p<0.01$) states. The negative Beta coefficient indicates that collusion was a negative predictor of vegetable oil market performance in the states. The implication is that a 1% increase in collusion will decrease

the vegetable oil market performance in Delta and Rivers States by 0.686% and 0.746% respectively.

On product innovation, the value recorded ($\beta=0.343$: $P<0.05$) was statistically significant at 5% probability level which is an indication that product innovation is a positive predictor of vegetable oil market performance in Edo state. This indicates that a 1% increase in product innovation increased the vegetable oil market performance in Edo state by 0.343%.

Therefore market conduct with F-statistic value (F=5.206, $p<0.01$) collectively had a statistically significant effect on palm oil market performance at 1% level of probability; with some parameters being positive predictors and others negative predictors. These findings support the findings of Kunene and Chung (2020) [14] and Suroso *et al.* (2020) [20] who stated that conduct (collusion) had a negative statistically significant effect on performance in palm cooking oil industry in Indonesia. This is also in line with the studies of Tan & Wang (2017) [21] and Chen *et al.* (2022) [4] who reported that some parameters of conduct (excessive allowance allocation and lack of investment) negatively affected the performance of China's Pilot ETS. Thus, the null hypothesis which stated that market conduct has no significant effect on the performance of edible oil market is hereby rejected.

Table 4: Effects of Market Conduct on Palm Oil Market Performance in Niger Delta

Variables	Niger Delta	Delta State	Edo State	Rivers State
Constant	0.9253	0.5475	0.2785**	0.8475***
	(0.9927)	(0.8088)	(2.5318)	(5.5283)
Collusion	0.8256***	-0.6861***	-0.7826	-0.7457***
	(3.3196)	(-4.4697)	(-1.4338)	(-7.3758)
Product Innovation	-0.2007	-0.3657	0.3428**	0.1442
	(-1.1351)	(-1.1259)	(5.3053)	(0.6692)
Fair Prices	0.9867	0.7256	0.2102	-0.5695
	(0.6873)	(0.3330)	(1.4221)	(-1.2168)
Diagnostic statistics				
R^2	0.6121	0.6574	0.7012	0.8215
Adjusted R^2	0.5784	0.6032	0.6726	0.7812
F-statistic	5.2059***	7.6350***	8.4358***	9.9073***

Note *** = significant at 1%; ** = significant at 5% T value in Parenthesis

Conclusion

This study disclosed that the structure and conduct of the markets have positive influence on its performance particularly through product innovation, fair prices and product homogeneity. It also revealed that conduct negatively influence performance through collusion. Therefore, it is recommended that policy interventions on product innovations, fair prices and product homogeneity are encouraged, while colluding practices should be discouraged in the edible oil markets.

This study has contributed to the existing body of knowledge on the effect of structure and conduct on the edible oil market performance and has established that Product homogeneity, fair pricing and innovations are the key drivers in the edible oil agribusiness enterprise in the Niger Delta region of Nigeria. The study also affirmed Bucket theory of consumer retention is an effective marketing strategy and that price stability enhance investment decision and subsequent stable livelihood of edible oil market agribusiness stakeholders.

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