



Assessment of Income Inequality, Structure and Conduct of Cocoa Marketers in Osun State, Nigeria

A. I. Olutumise^{1*}, L. O. Oparinde² and O. O. Simon-Oke³

¹*Department of Agricultural Economics and Extension, Adekunle Ajasin University, P.M.B 001, Akungba-Akoko, Ondo State, Nigeria.*

²*Department of Agricultural and Resource Economics, Federal University of Technology, P.M.B. 704, Akure, Ondo State, Nigeria.*

³*Department of Economics, Federal University of Technology, P.M.B. 704, Akure, Ondo State, Nigeria.*

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JSRR/2019/v25i630204

Editor(s):

(1) Dr. Ani Matei, Professor, Faculty of Public Administration, National University of Political Studies and Public Administration Bucharest, Romania.

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Complete Peer review History: <http://www.sdiarticle4.com/review-history/53025>

Original Research Article

Received 25 September 2019

Accepted 29 November 2019

Published 24 January 2020

ABSTRACT

The level of income inequality and structure-conduct of cocoa marketers were evaluated in Osun State, Nigeria. Primary data were collected with the aid of a well-structured questionnaire, while a multistage sampling procedure was used to select 120 respondents for the study. Descriptive statistics, concentration ratio, Gini coefficient, index of dissimilarity, Herfindahl index; Ordinary Least Square (OLS) as well as Quantile Regression (QR) were used as analytical tools. The result showed the value of Gini coefficient as 0.76, which established a relatively high level of income inequality among cocoa marketers in the study area. The concentration ratio of one, two and four largest marketers in the cocoa marketing business also accounted for 19.2%, 31.9% and 45.8% respectively, of the total volume of cocoa beans sold in the study area, while the value (0.069) of the Herfindahl index further confirmed the presence of low concentration in the market share of cocoa marketers in the study area. The OLS result revealed that household size, education, access to credit, depreciation cost on fixed inputs and labour cost constituted the main factors affecting the

*Corresponding author: E-mail: adewale.olutumise@aau.edu.ng;

income of the marketers, while depreciation cost on fixed inputs and labour cost were consistently significant in OLS and across the conditional quantiles (q25, q50 and q75). Therefore, it is expected that appropriate practical approach in addressing high level of income inequality as identified by the study should be taken by all stakeholders in the industry, with a view to making low-interest credit facilities and incentives available to the marketers in order to increase their scale of operations, and consequently bridge the inequality gap.

Keywords: Cocoa marketers; income inequality; structure-conduct; Nigeria; quantile regression.

JEL Classification: M310, Q02, Q13.

1. INTRODUCTION

Agriculture is sustainable livelihood for millions of Nigerians over the years. Its relevance for economic growth and development has called the attention of all levels of government to the sector. It has many products with different value chains that range from production through processing to marketing before reaching the consumers [1]. Cocoa happens to be one of the main agricultural products that specifically possess these value chains. Cocoa has been all-season-blessing to the Nigerian economy from independence. Its contributions to agricultural Gross Domestic Product (GDP) and nation's GDP cannot be over-emphasized. Cocoa provides means of livelihood, sustenance, source of raw materials for industries and employment for millions of Nigerians [1]. It is the main agricultural export and most important non-oil export good in Nigeria. For some years now, Federal and State governments of Nigeria have been advocating for diversification of the economy after the fall in the oil prices that form bulk of export in Nigeria. The policy has given tree crops such as cocoa and food crops such as cassava attention which is the reflection of the presidential initiative on the production of these crops [2]. The development has encouraged more people into the establishment of cocoa plantation and the participation of many people in cocoa marketing in Nigeria. Cocoa marketing as a key component of cocoa value chain has made significant contributions in terms of foreign exchange earning capacity and income generation to Nigerian economy since its introduction into the country [3]. According to Cadoni [4], cocoa marketing value chain involves Local Area Agents (LAAs) or Local Buying Agents (LBAs) who will purchase cocoa beans at farm gate, and then cocoa merchants who operate the grading, involving quality inspection by grading agents. The LBAs could either be companies, individuals, or cooperative societies. The graded cocoa beans are either sold to the

exporters or local processors. Each stage has played a vital role in the smooth running of cocoa marketing from the point of farm gate to the point of export; and as well contributes significantly to the economy. Despite the economic potentials of cocoa marketing business, it has been facing challenges like other enterprises in Nigeria. According Nkang et al. [5], the abolition of the commodity board due to market liberation has increased the number of people marketing cocoa and this has also led to numerous channels for producers to market their products. However, the outcome of the policy has resulted into free-market pricing and fluctuation in cocoa prices. The market prices are characterized by high volatility and this has resulted in a great disparity between prices received by cocoa producers and cocoa firms [4].

Again, the channels involved in the cocoa marketing affect producer's prices and also create inefficiencies in the enterprise. There is also wide inequality in the margins in terms of market power between exporter companies and middle-men; and between middle-men and producers. This has contributed to the inability to get the best from the enterprise with high-income inequality and unequal access to basic infrastructure in cocoa marketing [6]. Also, income distribution pattern among the cocoa marketers has been a great concern in determining the level of economic growth and as well know the best policy practices that could address all the problems affecting both small and large scale cocoa markers.

Moreover, poor marketing infrastructure, lack of marketing skills, poor quality of local produce, market information and among others are main problems facing the enterprise [1]. In view of this, the study specifically examined the conduct and structure of cocoa marketing; and determined factors affecting marketer's level of income in the study area. Therefore, the assessment of the structure and conduct in cocoa marketing

industry will unfold the market power that subsists in the business as well as how to address the main constraints facing the market as reported by Yesufu et al. [7]. This will also help to reduce problems of seasonality and unstable prices associated with the market. The study will also be an eye-opener to specifically identify factors affecting the enterprise across different levels of income accrued from the business instead of the traditional average comparison.

2. METHODOLOGY

The study area was Osun State, Nigeria. According to National Population Commission (NPC), the State is about 3.4 million people and covers an area of nearly 14,875 square kilometers [8]. Geographically, it lies between latitude 7°30' North and Longitude 4°30' East and situated in the tropical rain forest. The main occupations of the people in the State are mostly artisans, farmers and traders. The farmers in the area grow both cash and arable crops such as cocoa, palm oil, cassava, yam and maize. The State is ranked among the five top cocoa producing States in Nigeria [9]. Primary data were used for this study and the data were sourced with the aid of a well-structured questionnaire, personal interview and focus group discussions. The study employed a multistage sampling technique to arrive at the sample size. The first stage involved purposive selection of five Local Government Areas (LGAs) based on their predominance in cocoa production and marketing; and their contributions to the State revenue on agriculture. The LGAs were Ife South, Ife North, Ife East, Obokun and Atakunmosa East. In stage two, a simple random sampling procedure was employed to select two communities each from the selected LGAs. Final stage also involved a simple random sampling technique where twelve (12) respondents were randomly selected from each community. This, therefore, added up to one hundred and twenty (120) cocoa marketers who are mainly LBAs/LAAs. However, one hundred and twenty (120) copies of the questionnaire were administered but one hundred and seventeen (117) were properly filled and returned, that is about 2.5% copies of the questionnaire were invalid and not used in the analysis of this study. The study made use of descriptive statistics, concentration ratio, gini coefficient, herfindahl index, index of dissimilarity, Ordinary Least Square (OLS) and Quantile Regression (QR) for data analysis.

2.1 Model Specification

The structure of the market was examined using concentration ratio, Gini coefficient, index of dissimilarity and Herfindahl index.

2.1.1 Concentration Ratio (CR)

It is the share of the total size of a given market or industry that is accounted for by a few largest firms [10], [11].

$$CR_i = \frac{\sum_{i=0}^n (S_i)}{\sum_{i=0}^n (S_{tn})} \times 100 \quad (1)$$

$i = 1, 2, 3, 4, \dots, n$. where n is the number of respondents

S_i is the market share of each firm

S_{tn} is the sum of market share of all the firms

2.1.2 Lorenz's curve and Gini coefficient

Lorenz curve which graphically depicts the nature of marketer's concentration was quantitatively analysed using Gini coefficient. The proportion of marketer was plotted on the x-axis while the cumulative proportion of the total sales was plotted on the y-axis. A perfectly equalized degree of concentration is depicted by the straight diagonal line $y = x$ called the line of perfect equality (the 45° line). The farther the curve is from the diagonal, the greater the degree of inequality and vice versa. The extent of these curves from the line reveals the level of marketing concentration among the marketers and the nature of market competition in the study area. Again, the Gini-coefficient is a measure of statistical dispersion most prominently used as a measure to show the degree of income distribution or inequality of wealth distribution between different households in a population [12]. According to IMA [13], Gini-coefficient is defined as a ratio with values between zero and one (0 - 1). A low Gini-coefficient indicates more equal income or wealth distribution, while a high Gini-coefficient indicates more unequal distribution. Zero (0) corresponds to perfect equality while one (1) corresponds to perfect inequality.

Gini Coefficient is mathematically represented as:

$$G.C. = 1 - \sum XY \quad (2)$$

Where; G.C. = Gini Coefficient, and

$\sum XY$ = the summation of cumulative proportion of the cocoa sellers (X) and the cumulative proportion of their sales earnings (Y).

2.1.3 Index of dissimilarity

According to Mafimisebi and Oguntade [14], the Index of Dissimilarity "ID" is the summation of vertical deviations between the Lorenz Curve and the line of perfect equality. The closer the ID is to 1, the more dissimilar the distribution is to the line of perfect equality.

The Index of Dissimilarity is calculated as:

$$ID = 0.5 \sum_{i=0}^n / X_i - Y_i / \quad (3)$$

where;

X_i is the cumulative proportion of the cocoa marketers

Y is the cumulative proportion of the total income of the cocoa marketers. This is modeled following [14].

2.1.4 The Herfindahl index

According to several authors [15], [10], [11], the index used to measure the market shares of all the firms in the industry, and these market shares are squared in the calculation to place more weight on the larger firms. If there are n firms in the industry, the herfindahl index can be expressed as:

$$HI = \sum(S_1^2 + S_2^2 + S_3^2 + \dots + S_n^2) \quad (4)$$

Where;

Hi is the Herfindahl Index

$i = 1,2,3, \dots n$

n = number of respondents

S_i is the market share of each firm

S_n is the market share of the nth firm

2.1.5 Ordinary Least Square (OLS) and Quantile Regression (QR) Models

OLS and QR were used to determine the factors affecting marketer's level of income in the study area. The OLS was modeled using four functional forms namely: linear, semi-log, double-log and exponential forms; in which the lead equation was selected based on the statistical significance of the estimated parameters, *a priori* expectations in signs of estimated parameters,

and the value of coefficient of multiple determinations (R^2) and Adjusted R^2 . The lead equation from the OLS was used for the QR model. The implicit function of the regression models fitted was presented as follows:

$$Y = f(X_1, X_2, X_3, X_4, X_5, \dots, X_8, e_i) \quad (5)$$

The explicit function estimates are presented as follows:

$$\text{Linear function: } Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_8 X_8 + e_i \quad (6)$$

$$\text{Semi-log function: } Y = \log \beta_0 + \beta_1 \log X_1 + \beta_2 \log X_2 + \dots + \beta_8 \log X_8 + e_i \quad (7)$$

$$\text{Cobb-Douglas function: } \log Y = \beta_0 + \beta_1 \log X_1 + \beta_2 \log X_2 + \dots + \beta_8 \log X_8 + e_i \quad (8)$$

$$\text{Exponential function: } \log Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_8 X_8 + e_i \quad (9)$$

Where;

Y = Total Revenue (₦)

X_1 = Age of marketers (years)

X_2 = Household size (number)

X_3 = Marketing experience (years)

X_4 = Level of marketer's education (years)

X_5 = Access to credit (1=Yes; 0=otherwise)

X_6 = Depreciation costs on fixed inputs (₦)

X_7 = Value of labour used (₦)

X_8 = Transport cost (₦)

β_0 = Constant term

e_i = Error term

$\beta_1 - \beta_8$ = coefficients

Moreover, the QR model helped to examine the behaviours of explanatory variables across different levels of revenue accrued from the enterprise and compare with the OLS estimates. In OLS estimates, the mean effect of the independent variable was analyzed on the dependent variable; while QR estimate analyses the mean effect of explanatory variable on the different quantiles of the conditional distribution. According to Greene [16], the quantile regression model is stated as:

$$\text{Quantile}[y|x, q] = x' \beta_q \text{ such that } \text{Prob} [y \leq x' \beta_q | x=q, 0 < q < 1] \quad (10)$$

$$F_n(\beta_q | y, X) =$$

$$\sum_{i: y_i \geq x_i' \beta_q} q | y_i - x_i' \beta_q | +$$

$$i: y_i < x_i' \beta_q n(1-q) | y_i - x_i' \beta_q | = i=1 \text{ to } n \quad y_i - x_i' \beta_q | q$$

$$(11)$$

Where;

$$g(e_{i,q}|q) = \begin{cases} q_{i,q}, & \text{if } e_{i,q} \geq 0 \\ (1-q)e_{i,q}, & \text{if } e_{i,q} < 0 \end{cases}, q_{i,q} = y_i - x_i'\beta_q \quad (12)$$

q is the conditional quantile of Y(marketer's revenue) given X (explanatory variables).

The essence of QR model in this study is that it analyzes the conditional quantiles of the dependent variable using covariates [17]. Again, QR deals with heteroscedasticity because it works by minimizing the sum of absolute values of residuals instead of the sum of squared residuals. The QR estimate has the ability to explain the effect of explanatory variables on the dependent variable. These diverse responses may be interpreted as differences in the response of the dependent variable to changes in the regressors at different points in the conditional distribution of the dependent variable [18,19].

3. RESULTS AND DISCUSSION

3.1 Summary Statistics of the Socio-economic Characteristics of the Marketers

The results of socio-economic characteristics showed that male marketers (93.2%) dominated the cocoa marketing business, while majority (85.5%) of them were married as presented in Table 1. This is likely to be connected with the energy and time-consuming nature of cocoa marketing, as men are capable of more rigorous work than females as reported by Abraham et al. [20] in their studies on cocoa insurance in Nigeria. Also, Abraham and Oladeji [21] opined that this may be due to tediousness of cocoa marketing activities that are not well suited for females such as bagging and loading. The average age of the respondents was 46 years old and about 65.8% of them were at most 50years old. This indicated that they were still very young and within the age of active labour force as reported by Oseni [22]. This is justifiable because cocoa marketing involves using aggressive marketing strategies with a high level of risk that can be undertaken by only the relatively young and able-bodied individuals. The majority (95.7%) of the respondents were literate with at least primary school education. Similar studies by Abraham and Oladeji [21], Farayola et al. [23] carried out in Osun and Oyo States respectively among cocoa marketers and

producers' choice of markets outlet respectively, affirmed that majority of the marketers were educated with at least primary school education; while the finding contradicted what was reported by Idowu et al. [24] that literacy level is very low among the cocoa marketers in South West Nigeria. About 49.6% of the respondents had between 6 and 10 persons per house, while only 36.9% of them belong to cooperative society. This result indicated that the household size was fairly large enough to influence marketing strategies vis-à-vis profit due to reduced labour costs in the long run. The average marketing experience was 17.9 years with nearly 42.1% of them had between 11 and 20 years of experience. This result was similar to the findings of Abraham and Oladeji [21] who reported that about 75% of the respondents have experienced cocoa marketers with more than 11 years marketing experience. It was also revealed that only few (10.3%) of the marketers had access to formal credit such as credit from commercial and agricultural banks. The result was similar to the findings of Fadipe et al. [25] where only about 28% of the respondents were members of cooperative societies in their studies carried out in Oyo State, Nigeria. This finding implies that cocoa marketers might not have access to loans and team assistance that could help them to acquire modern capital intensive equipment. The average income accrued from the business was ₦4,013,677.18 per annum with 25th, 50th and 70th percentile of ₦950,000.00, ₦1,500,000.00 and ₦3,000,000.00 respectively.

3.2 Conduct of Cocoa Marketers in the Study Area

Table 2 depicts the distribution of the respondents based on the conduct of cocoa marketers in the study area. The empirical findings revealed that many (47.9%) of the respondents used both family and hired labour to carry out their marketing operations, about 45.3% of them used only hired labour and just 6.8% of the marketers used family labour only in the area. The Table also showed that many (67.9%) of the respondents employed 6 – 10 workers in their stores, while about 22.0% of them employed 1 – 5 workers. Only 10.1% of the marketers employed more than 10 workers during the marketing season. The number of stores owned by the respondents was also ascertained. It was noticed that about 68.4% of the cocoa marketers had at least two (2) stores/warehouses in the area, while 31.6% of them had one store/ware house. It was observed

from the field that apart from the main store(s) in the town, most of the cocoa marketers had small stores in the villages that produce cocoa and as well support it with agents that would be moving around the farms to purchase cocoa beans. The findings also ascertained that there were two seasons of high volume of sales in the study area. Majority (88.9%) of the marketers attested that they made many sales during the peak season which is between September to December period, while about 11.1% of them said that they made sales most in light season. Nearly all the respondents (91%) rated the quality of cocoa beans they purchase as good; the remaining 11.6% of them attested that they do purchase "paruparu" (sub-standard beans) with the good cocoa beans. About 48.7% of the marketers were Licensed Buying Agents (LBAs) followed by cooperative society membership (41.9%) and the cocoa exporters (9.4%). In terms of how cocoa prices are determined in the market, many (51.3%) of the respondents said that exporters such as Agro, Amajaro, Alpha determine the price of cocoa beans. Some (35.0%) of the marketers said that price of cocoa beans is determined by exchange rate, that is, changes in dollar to naira. Other marketers (13.7%) said that price is determined through negotiation, quality of cocoa beans and cocoa main season (September to December). The majority (76.1%) of the respondents attested that it is discretionary while about 23.9% of the marketers said that the price given by the exporters will determine the price they will buy from producers. The marketers attested that the price difference ranges from ₦50 to ₦200 per kilo in the study area. The criteria to be satisfied before starting the business were also examined. As also revealed in Table 2, many (63.2%) of the marketers reported that the most important criterion was to get a substantial initial capital to

start the business. They said that one can start the business if he/she has enough start-up capital and this will determine the volume of market sales. About 24.8% of the respondents attested that one needs to belong to their association before one can start cocoa marketing, while few (12%) of the marketers said that one needs to undergo apprenticeship or training before he/she can start cocoa marketing so that one can acquire enough knowledge and information about the intrigues of cocoa marketing. The result is similar to the findings of Kimengsi et al. [26] who opined that more than 80% of the farmers depended on the informal marketing while less than 20% of the cocoa farming populations have successfully gone through training and certification, and approximately 20-30% of the farmers are affiliated to cooperatives.

Again, the Table showed that majority (69.2%) of the marketers sells their products (cocoa beans) to the exporters such as Alpha, Amajaro and Agro, while the remaining marketers (30.8%) export the cocoa beans themselves. The respondents were asked on how they usually get customers that sell cocoa beans to them. It was revealed that the majority (72.7%) of them get customers through agents and networking. Through this means, they connect based on information and availability of cocoa beans. The brokers (22.2%) were another means of getting customers while about 5.1% of the respondents said that they get customers through advertisement on radios and televisions in the study area. Nearly all of them attested that they do provide assistance and incentives to the cocoa farmers in order to buy from them. Some of the incentives include: agrochemicals, money, food crops and so on. The marketers were also interviewed on their sources of information on

Table 1. Socio-economic characteristics of the respondents

Variable	Mean	Dominant Indicator
Sex		93.2% Male
Marital Status		85.5% Married
Age	46.00	65.8% were at most 50 years old
Education		95.7% had at least primary school education
Household size	9.00	49.6% had between 6 and 10 persons
Marketing Experience	17.90	42.1% had between 11 and 20 years
Membership of cooperative society		36.88% belong to cooperative society
Access to Formal Credit		89.7% had no access
Revenue	4,013,677.18	39.3% accrued 1 – 2 million naira per annum
q25		950,000.00
q50		1,500,000.00
q75		3,000,000.00

Source: Computed Field Survey Data, 2017

Table 2. Distribution of respondents by the conduct of cocoa marketing in the study area

Conduct variables	Frequency	Percentage
Labour Source		
Family	8	6.8
Hired	53	45.3
Both	56	47.9
Numbers of Staff		
1 – 5	24	20.5
6 – 10	74	63.3
> 10	19	16.2
Number of Stores		
1	37	31.6
2	51	43.6
3	11	9.4
4	18	15.4
Season of High Volume of Sales		
Main crop	104	88.9
Light crop	13	11.1
Cocoa Bean Quality Rating		
Good	106	90.6
Fair	11	9.4
Marketers Category		
Cooperative Society	49	41.9
Licensed Buying Agent	57	48.7
Cocoa Exporter	11	9.4
Cocoa Price Determination Method		
Exchange rate	41	35.0
Exporter's discretion	60	51.3
Negotiation	3	2.6
Quantity of cocoa beans	13	11.1
Discretionary	89	76.1
Exporter	28	23.9
Criteria to be Satisfied before Starting Business		
Initial capital	74	63.2
Membership of the association	29	24.8
Training/Apprenticeship	14	12.0
Method of Sales of Cocoa		
Exportation	36	30.8
Exporter	81	69.2
Mode of Getting Customers		
Advertisement	6	5.1
Brokers	26	22.2
Networking and agents	85	72.7
Sources of Information		
Friends	11	9.4
Media/internet	38	32.5
Exporter	60	51.3
Co-marketers	8	6.8
Mode of Transportation (*multiple choices)		
Motorcycle/Bike/"Okada"	117	100.0
Motor/Vehicle	103	88.0

Source: Computed Field Survey Data, 2017

cocoa marketing most especially on prices. Most (51.3%) of the sampled marketers said that they get information from the exporters on prices and

behaviour of cocoa beans in the world market. Some (32.5%) of the respondents also said that they sourced information from media such as

television, radio, newspapers and the internet. They do follow the business news on the media every time. About 6.8% and 9.4% of the marketers reported that they sourced information from their co-marketers and friends respectively. In the same vein, the mode of transporting cocoa beans was asked from the sampled marketers. It was revealed that all the respondents interviewed had motorcycle/bike popularly called "Okada" in the study area. It was observed from the field that "okada" is commonly used because of the bad road networks that lead to most producers' farms. It is also easy to maintain, fuel-efficient and can ply most of the places where motor vehicle cannot go. Nearly 88.0% of the respondents had vehicles/motor such as cab star, bus, pickup, Hilux Van, Dyna, lorry and trailer to transport cocoa beans at the State and inter-State levels, and to the point of export.

3.3 Structure of Cocoa Marketers in the Study Area

The analytical tools such as Lorenz's curve, Gini coefficient, Concentration ratio, Herfindhal index and Index of dissimilarity were used to describe the structure of cocoa marketers in study area. Table 3 showed the estimation of Lorenz's curve and Gini coefficient that ascertain the income inequality of the cocoa marketers. It was observed in Fig. 1 that the Lorenz curve deviated from the diagonal line and this is an indication that there is a presence of inequality among cocoa marketers in terms of income accrued from the business. From Table 4, the value of Gini coefficient of cocoa marketers as estimated from Table 3 was 0.76 which implies a relatively high level of inequality in income distribution among cocoa marketers in the study area. The disparity between the highest and lowest income earners in the study area was 76.0% and this could be as a result of volume of sales accrued by the exporters among the marketers in the area. It was also observed that most of the cocoa marketers sell their products to the exporters and as well serve as agents to the exporters. In the same vein, the value of the index of dissimilarity of 0.676 reiterated the presence of disparity among the cocoa marketers. Again, the values of concentration ratios and herfindhal index further detailed the market share of the enterprise in the study area. Like other marketing industry, cocoa marketers have some basic functions which include buying, selling, financing, risk-bearing and merchandising. Also shown in Table 4, the one, two and four largest marketers in the cocoa marketing business accounted for 19.2%, 31.9%

and 45.8% respectively of the volume of cocoa beans sold in the study area. This indicated that there is low concentration in the cocoa marketing industry in the area. Therefore, the type of market structure that operates in the study area based on the value of concentration ratio is monopolistic competition. According to Adebayo [27], a monopolistic competition market combines certain features of both perfect competition and monopoly. It is generally characterized by a large number of buyers and sellers each accounting for a very small proportion of the total output, there are also no significant or effective barriers to entry into the cocoa marketing industry, and there is a limit to the extent to which each marketer can adjust its price. Hence, each marketer charges prices that are not too high or too low relative to price charged by other marketers in the industry. In this market, each cocoa marketer often sponsor advertising campaigns and adopts sales promotional strategies such as borrowing producers' money, the supply of agrochemicals and so on, to expand or at least retain its market share. The value (0.069) of the Herfindahl index further confirmed the presence of low concentration in the market share of cocoa marketers in the study area. The result of this study was contrary to the findings of Folayanet al. [28] who reported that the outcome of various parameters measuring market concentration indexes showed that cocoa market was found to be perfectly competitive.

3.4 Factors Affecting the Income Level of Cocoa Marketers in the Study Area

Table 5 presented the results of OLS and QR that showed the various factors affecting marketers' level of income in the study area. The OLS analysis was carried out under four functional forms (Linear, semi-log, double-log and exponential) and the linear functional form was chosen as the lead equation based on economic, statistical and econometric criteria. The value of R^2 was 0.9169 which means that about 92% of the total variations in the cocoa marketer's income were accounted for by all the explanatory variables in the regression model. The F-value of 147.54 was significant at 1% level which implies that all the explanatory variables jointly exerted significant influence on the income of the marketers in the area. Again, the results of QR revealed that R^2 for q25, q50 and q75 were 0.6508, 0.7276 and 0.7826 respectively and this indicated that variations in marketer's income under q25, q50 and q75 were explained by about

65%, 73% and 78% of all the explanatory variables under each quantile in the model respectively. According to the Table, there was a positive relationship between marketer's income and age of the marketer under q50 and q75, while negative relationship was observed in the OLS and q25. The coefficient of the age was only statistically significance under q25 and this implied that as the marketers are getting older in the q25 category, the income reduces by ₦377, 582.50. The coefficient of household size was negative in all the cases but only statistically significant under the OLS. The result implies that on the average, a unit increase in the number of household size reduces marketer's income by ₦60, 069.25. This result is contrary to the findings of Farayola et al. [23] who reported that household members provide some marketing functions at a reduced cost which is an incentive to marketing system efficiency. The coefficient of marketing experience was positive in all the categories but statistically significant under q50 and q75. This indicated that a unit increase in the year of experience increases the income of the marketers in both q50 and q75 by ₦1,509.70 and ₦1,106.20 respectively. The coefficient of education was positive in all the categories but not statistically significant under q25. The result showed that an increase in the year of education will increase income under OLS, q50 and q75 by ₦226,895.40, ₦164,687.30 and

₦35,635.90 respectively. Similar result was found out by Mignouna et al.[19] among yam-growing households in Ghana and Nigeria, that education is consistently significant in both OLS and conditional quantiles. Moreover, marketers who had no access to credit statistically increase income under OLS and q25 by ₦17,28.81 and ₦12,053.83 respectively. The coefficient of depreciation costs on fixed inputs had positive relationship with income accrued by the cocoa marketers. It indicates that a naira increase in the depreciation costs on fixed items such as weighing balance, aqua boy, scoop, counter balance etc.; will statistically increase marketer's income by ₦168.20, ₦157.70, ₦194.11 and ₦187.60 for OLS, q25, q50 and q75 respectively. Similarly, cost of labour had a positive and significant relationship with marketer's income. It implies that labour increases income by ₦5, 997.41, ₦4, 140.22, ₦4, 448.72 and ₦5, 272.09 under OLS, q25, q50 and q75 respectively. This result concurs with the findings of [9] who stated that labour cost is positive and significant at 1% level with the cocoa producer's income as well as their profit. The cost of transportation was statistically significant but negatively affected marketer's income under q25 and q50. This means that a naira increase in the amount of transport cost decreases marketer's income by ₦4,512.47 and ₦1,005.12 respectively.

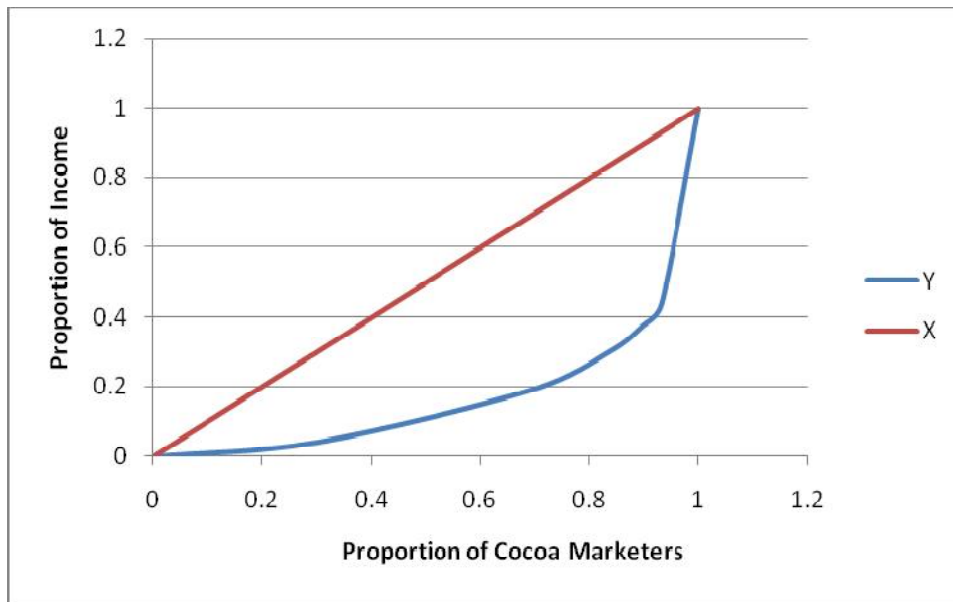


Fig. 1. Lorenz's Curve of the Cocoa marketers in the study Area
 Source: Computed Field Survey Data, 2017

Table 3. Estimation of Lorenz’s Curve and Gini coefficient of the Cocoa Marketers in the study area

Total Revenue (₦)	N	X	CP	TMR (₦)	PS	CPTMR(Y)	XY
≤ 1000000	35	0.30	0.30	19630000	0.04	0.04	0.012505
1000001 -2000000	46	0.39	0.69	69750000	0.15	0.19	0.074831
2000001 – 4000000	17	0.15	0.84	52900000	0.11	0.30	0.044023
4000001 – 6000000	7	0.06	0.90	34900230	0.07	0.38	0.022574
6000001 – 8000000	4	0.03	0.93	29420000	0.06	0.44	0.015041
> 8000000	8	0.07	1.00	263000000	0.56	1.00	0.068376
Total	117	1.00		469600230	1.00		0.23735

Note: N= number of marketers; X=proportion of marketers; CP=cumulative proportion of marketers; TMR=total market revenue; PS=proportion revenue; CPTS = cumulative proportion of total market revenue. Source: Computed Field Survey Data, 2017

Table 4. Summary Results of the Structure of Cocoa Marketers in the Study Area

Index	Symbol	Formula	Value	Implications
Concentration ratios	CR	$\frac{\sum_{i=0}^n (S_i)}{\sum_{i=0}^n (S_{tn})} \times 100$	CR ₁ = 19.2% CR ₂ = 31.9% CR ₄ = 45.8%	Low concentration: Monopolistic competition
Herfindahl index	HI	$\sum_{i=0}^n (S_i^2)$	0.069	Low concentration
Lorenz’s curve	LC	$\sum XY$	0.23735	Presence of inequality
Gini Coefficient	GC	$1 - \sum XY$	0.76265	Presence of inequality
Index of Dissimilarity	ID	$0.5 \sum_{i=0}^n (X_i - Y_i)$	0.676	Presence of dissimilarity

Source: Computed Field Survey Data, 2017

Table 5. OLS and QR results of factors affecting the income level of cocoa marketers in the study area

Explanatory Variable	OLS Coefficient	Quantile Regression		
		q25 - Coefficient	q50- Coefficient	q75- Coefficient
Age	-150519.10 (0.419)	-377582.50*** (0.000)	272865.40 (0.361)	165780.90 (0.412)
Household size	-60069.25*** (0.001)	-29978.30 (0.127)	-9877.34 (0.481)	-26288.51 (0.265)
Experience	3253.33 (0.192)	1509.70** (0.012)	1106.20*** (0.005)	26.13 (0.993)
Education	226895.40* (0.070)	145123.00 (0.510)	164687.30* (0.082)	35635.90*** (0.003)
Access to credit	-17280.81*** (0.005)	-12053.83* (0.066)	-1023.30 (0.834)	-6654.24 (0.184)
Depreciation cost on fixed inputs	168.20*** (0.000)	157.70*** (0.000)	194.11*** (0.000)	187.60*** (0.000)
Labour costs	5997.41*** (0.000)	4140.22*** (0.000)	4448.72*** (0.000)	5272.09*** (0.000)
Transport costs	-5281.81 (0.283)	-4512.47*** (0.000)	-1005.12** (0.035)	-83.63 (0.980)
Constant	-829266.90 (0.014)	-377716.40 (0.659)	-1399003.00 (0.003)	-924719.20 (0.035)
R ²	0.9169	0.6508	0.7276	0.7826

Note: ***, **, *, means significant at 1%, 5% and 10% respectively.

Source: Computed Field Survey Data, 2017

4. CONCLUSION AND RECOMMENDATIONS

This study concludes that many of the marketers were young men, married and experienced with a good level of literacy. The market structure is monopolistic competition and there is fairly high-income inequality in their income distribution because the four largest marketers owned market share of about 46% in the area. The conduct reflected that poor road network and high cost of transportation of the product has been a serious challenge among the cocoa marketers. Household size, education, depreciation costs on fixed inputs, labour cost and transport cost were germane factors determining income levels of the cocoa marketers. However, depreciation costs on fixed items and labour cost have been consistent in affecting the income of the marketers at different quantile classes in the area. Therefore, variables such as fixed inputs, labour and education must be given a priority in addressing income distribution problems in the area. The lower quantile group needs to be assisted by the relevant stakeholders through incentives such as credit and subsidies, with favourable government charges on tax and grading fee. Provision of basic infrastructures and the enabling environment will also encourage the marketers to be more efficient and consequently bridge the inequality gap in cocoa marketing industry in the study area. Therefore, it is expected that appropriate practical approach in addressing high level of income inequality as identified by the study should be taken by all stakeholders in the industry, with a view to making low-interest credit facilities and incentives available to the marketers in order to increase their scale of operations, and consequently bridge the inequality gap.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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The peer review history for this paper can be accessed here:
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