

An Assessment of the Market Structure and Performance of Cassava Marketers in Cameroon

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Abstract

Market structure is one of the most important factors determining the efficiency of the marketing system. The study therefore examined the marketing of cassava in Cameroon. Primary data were collected from 326 cassava marketers operating in fifteen (15) markets from three (3) out of Cameroon's ten (10) regions, namely the Centre, Littoral and West regions. Cassava traders were randomly sampled in each market. The study used descriptive statistics, the Gini coefficient and the Lorenz curve to determine the degree of market concentration in the study area, marketing efficiency was used to measure the performance of the cassava marketers. The findings show that majority 63% of the respondents were females, in the active age group of 20-65 years. The Findings equally shows that the Gini coefficient was 0.76 and 0.79 for wholesalers and retailers respectively, indicating a highly concentrated market hence an oligopoly market structure. The study further revealed an average marketing efficiency of 14.20% and 87% for retailers and wholesaler respectively. To influence the dynamics of price on the consumers, it is necessary to set up policies that could improve availability and accessibility of cassava in markets.

Keywords: Cameroon, Cassava, Gini coefficient, market structure, Performance

Résumé

La structure du marché est l'un des facteurs les plus importants qui déterminent l'efficacité du système de commercialisation. L'étude a donc examiné la commercialisation du manioc au Cameroun. Les données primaires ont été recueillies auprès de 326 négociants en manioc opérant sur quinze (15) marchés dans trois (3) des dix (10) régions du Cameroun, à savoir les régions du Centre, du Littoral et de l'Ouest. Les commerçants de manioc ont été échantillonnés au hasard dans chaque marché. L'étude a utilisé des statistiques descriptives, le coefficient de Gini et la courbe de Lorenz pour déterminer le degré de concentration du marché dans la zone d'étude, l'efficacité de la commercialisation a été utilisée pour mesurer la performance des négociants en manioc. Les résultats montrent que la majorité des personnes interrogées (63%) sont des femmes, dans la tranche d'âge active de 20 à 65 ans. Les résultats montrent également que le coefficient de Gini est de 0,76 et 0,79 pour les grossistes et les détaillants respectivement, ce qui indique un marché très concentré et donc une structure de marché oligopolistique. L'étude a également révélé une efficacité marketing moyenne de 14,20 % et 87 % pour les détaillants et les grossistes respectivement. Pour influencer la dynamique des prix sur les consommateurs, il est nécessaire de mettre en place des politiques qui pourraient améliorer la disponibilité et l'accessibilité du manioc sur les marchés.

Mots-clés: Cameroun, Coefficient de Gini, Manioc, Performance, Structure du marché.

Introduction

The availability of sufficient and sustainable food is the most important pillar in many aspects of human life (Taylor, 2016; Rajaram and Van Ginkel, 2019; Mgale and Yunxian, 2020). Economists have long been concerned with the instability of microeconomic theory to explain the behaviour of firms in specific market settings (McChesney, 2013; Malte Dold and Krieger, 2021). Industrial organization theorists have developed an alternative approach in which a concrete specification of market structure is substituted for hypothetical conditions of perfect competition (Schwimmer, 1979; Devin Garcia *et al.*, 2018). According to OECD (2021) market structure is a set of market characteristics that determine the economic environment in which firms operate, essentially dealing with the size and design of the market. On the other hand, Nzima and Dzanja (2015) describe market conduct as the pattern of behaviour that firms follow in adapting to the market in which they sell or buy. Market conduct is essentially concerned with the behaviour of firms and market participants in terms of pricing, advertising methods, exclusionary tactics such as collusion, gender discrimination and monopolistic practices.

Ruttoh *et al.* (2018) assert that before a marketing system can be called good or efficient, its structure and behaviour must be critically examined. Garcia *et al.* (2018) argue that market behaviour is strongly influenced by market structure. The behaviour of sellers in a market could adversely affect the efficiency of the system as a whole and as such governments around the world closely monitor market conduct with a view to taking remedial action if the behaviour is seen as detrimental to efficient marketing.

A market is said to be competitive when there are many buyers and sellers, free entry conditions, a high degree of price competition and perfect market knowledge (OECD, 2018). Bukar *et al.* (2015) and Torsten Gerpott and Jan Berends (2022) posited that the ideal market structure for optimal efficiency is pure competition. When analysing market structure, market concentration and entry conditions are taken into account. Market concentration is defined as the number and size distribution of sellers and buyers in the market (Rumsey, 2022). According to some researchers, access to efficient markets is considered an essential tool for lifting farmers out of poverty and enhancing food security in developing countries (Fafchamps *et al.*, 2005; Panda and Sreekumar, 2012). In addition, literature on agricultural marketing has indicated that favourable marketing performance would encourage farmers to produce, adopt improved technologies and increase the share of prices received by the farmer (Barrett, 2008).

Nevertheless, smallholder farmers can still face various barriers to participate in markets (e.g. high transaction costs and inefficient information flows), climate change, price shocks, limited financing options and inadequate access to healthy and nutritious food. These lead to limited bargaining power and channel choices for farm households (Omiti *et al.* 2009; Fan and Rue, 2020). As a result, farm gate prices are depressed, and production incentives are distorted (Mmbando *et al.*, 2015). The successful increase in productivity and profitability largely depends on the potential of a marketing system to support such an improvement (OECD, 2018).

Agricultural marketing is one of the important branches of marketing that deals with the exchange of agricultural goods (Mareeh, 2021). Agricultural marketing is a critical aspect of national development. It serves as a means of livelihood for millions of market practitioners, stakeholders and policy makers. Haliru and Ibitoye (2014) and Ruttoh *et al.*, (2018) described agricultural marketing as an important means of development, especially for developing countries.

Cassava is becoming a key crop in Cameroon's new agricultural development strategies and significant investments have been made in the cassava sector in recent years (PNDRT, 2005; Daka *et al.*, 2021). In spite of its importance, the performance and structural characteristics of cassava markets in the region are uncertain. In addition, the agricultural marketing literature suggests that favourable marketing performance would encourage farmers to produce, adopt improved technologies and increase the share of prices received by the farmer (Zeller *et al.*, 1998; Barrett, 2008). However, smallholder farmers still face various barriers to market participation (e.g. high transaction costs and inefficient information flows), resulting in limited bargaining power and channel choices for farm households (Omiti *et al.*, 2009; Mgale and Yunxian, 2020). Indeed, cassava is also a major cash crop for a large number of households and is sold fresh or after processing to generate income, often used by women for household purchases, children's education, health and investment in business (Ndjouenkeu *et al.*, 2020).

The success of increasing productivity and profitability depends largely on the potential of a marketing system to support such improvement. Therefore, this study aimed at determining the structure and performance of cassava marketing as well as examining the factors that influence the sales revenue of cassava marketers in the study area.

Materials and Methods

This study utilizes primary data from the Center, Littoral, and West regions of Cameroon. Cameroon is located between latitude 2°N to 13°N and longitude 8°25'E and 16°20'E in the Central African subregion. It opens to the Atlantic Ocean in the west with a total coastline of 402 km. It is bounded to the west by Nigeria, northeast by Chad, south by Gabon, DR Congo, and Equatorial Guinea, and to the east by Central African Republic. It has a total surface area of 475,650 km which is distributed into five agroecological zones in ten geographical regions (MINFOF, 2018). The most notable zones are the Sudano-Sahelian, High Guinea Savannah, Western Highland, Monomodal Humid Rainforest, and the Bimodal Rainforest (Figure 1). This agroecological diversity permits the growth of most crops that characterize other African nations hence the name-tag "Africa in miniature" (MINEPDED, 2017). By this natural virtue over other African nations, Cameroon has become the breadbasket of Central Africa and supplies to Gabon, Central African Republic, Equatorial Guinea, and Tchad, as well as neighboring Nigeria to the West.

Data Collection. In our context, we employ GC, ME and Lorenz curves as well as a binary logistic model to analyze cassava market structure. The logistic model is used to evaluate inherent market factors which are omitted in most market concentration models while GC and Lorenz curves are used to examine the market concentration. According to the Food and Agricultural Organization (FAO, 2006), using the GC and Lorenz curve enables an evaluation of the level of inequality or equality in the sales volume (sales capacity) and realized income amongst the sellers within a market. This approach has also been used by Thu *et al.* (2020) to analyze of Tuna Value Chain.

The basic estimation model for GC is given by:

$$GC = 1 - \sum X * Y \quad (1)$$

Where, n represents the number of firms (cassava sellers) while $\bar{x}$ denotes the percentage of cassava sellers in the market, and $\sum_{i=1}^n x_i$ represents the cumulative proportion of cassava sales for sellers in the market. GC represents the Gini Coefficient. (Bukar *et al.*, 2015 and Bannor *et al.*, 2018) assert that GC values approaching 0 indicate perfect equality and perfect competition (no difference in market shares) between market participants while median values indicate oligopolistic or structures of monopolistic competition. On the other hand, values approaching 1 indicate perfect inequality and monopolistic market structures. To better appreciate the outcome, the generated non-aggregated GCs are represented on a Lorenz curve. A Lorenz curve closer to the line of equality indicates an equality among the market participants and a Lorenz curve further from the line of perfect equality indicates inequality among the market participants.

Given that our aim is to depict a clear snapshot of the cassava market, we augmented GC with marginal efficiency analysis. ME generally permits the measurement of intermediary value addition which is omitted in other concentration models (Haruna *et al.*, 2012; Jeyanthi, 2018). In essence, the basic Shephard model for market efficiency is given by:

Assuming marketing cost is represented by total cost as;

And marketing margin represented by total revenues from sales (total value product);

Then the model could be rewritten as ;

$$ME = 100 - \frac{\text{Marketing cost}}{\text{Marketing margin}} \times 100; 0 \leq ME \leq 100 \dots \dots \dots (2)$$

Where, C represent the entry cost which is mostly sunk and VC represent the variable cost of the firm (cassava seller). Q and P represent the capacity (quantity of cassava volume) and price per unit for every Q for every cassava seller in the market. Like GC, when values of ME approach 0 it indicates perfect competition among market participants. Whereas, when ME approaches 1 it indicates situation of perfect monopoly.

Median values equally indicate varying degrees of oligopolistic competition.

Results and Discussion

Here we focus on personal characteristics that shape market-participation (Table 1) age, educational level, gender, household size, marital status. The socio-demographic characteristics of the farmers interviewed shows the general information and the socio-demographic characteristics of the household by region. Women were more involved in cassava marketing than men. On average, 53% of the surveyed marketers were women, while 29% were men, and 19% is missing data. This could be due to the relative skewed distribution of economic opportunities between women and men. With men having more opportunities, they are free to choose other segments and industries to be employed. This is not the case for women as such they are more likely to hop on any “neglected” market “leftovers.” Baagyere *et al.* (2023) highlight similar results with women in the chicken egg market in Northern Ghana.

On average, 30% of cassava marketers were married, while 26% were widowed, 19% were single, 6% were divorced, and 18% corresponds to missing data. Specifically, in the West region, the marital status showed that 67% of the marketers were married.

In the Littoral region, the results showed that 45% of the marketers were married. In the Center region, the results showed that 40% of the marketers were married. According to Anjikwi *et al.* (2020), marriage brings stability to the activity and could lead to higher productivity. In some cases, married women benefit from their partners' networks and resources to enhance their activities. In addition, engaging in cassava marketing for a married woman might serve as a suitable household income and welfare diversification strategy (Anjikwi *et al.*, 2020).

Cassava marketers are averagely educated. Over 98% have at least gone through the primary education which may imply most marketers can read and write. A level of education is critical for cassava marketers as it might enable them to track market trends of cassava prices, and this increases their ability to develop market strategies. Ammanuel (2020) highlights that the education of sorghum marketers in Benue State played a crucial role in their market participation. In addition, Nkamigbo (2019) observed that educated people are more enlightened, well conversant with efficient marketing of their marketable surplus and hence can reduce marketable loss.

The results in Table 3 shows that the pooled age of the respondents in the West Region, ranges between 26 and 66 years with a mean and standard deviation of 41 years and 11.92, respectively. In the Littoral Region, the results shows that the age of respondents range between 40 and 65 years with a mean and standard deviation of 53 years and 3.53, respectively. In the Centre Region, the results shows that the age of respondents range between 20 and 51 years with a mean and standard deviation of 36 years and 11.87, respectively. In the three regions the results of the respondents ranges between 20 and 66 years with a mean and standard deviation of 36 years and 83.53 respectively.

The pooled household size shows that of the respondents ranges in the West Region, ranges between 1 and 68 persons with a mean and standard deviation of 6 persons and 11.54, respectively. In the Littoral Region, the results shows that the household size of respondents range between 2 and 25 persons with a mean and standard deviation of 11 persons and 0.41 respectively. In the Centre Region, the results shows that the household size of respondents range between 1 and 80 persons with a mean and standard deviation of 10 persons and 2.51 respectively. In the three regions the results of the respondents ranges between 1 and 80 persons with a mean and standard deviation of 11 persons and 2 respectively.

The pooled sex shows that in the West Region, the results shows that 43% and 56% of respondents are male and female respectively. In the Littoral Region, the results show that the sex of respondents range between a man and female of 17% and 84% respectively. In the Centre Region, the results show that the age of respondents ranges between a man and female of 42% and 59% respectively. In the three regions the results of the respondents show that 37% and 63% of the respondents are male and female, respectively.

The results in Table 3 show that the pooled marital status in the West Region shows that 29%; 27%; 15%; and 19% of the respondents are Married, Single, Divorce, Widower or widowed respectively. In the Littoral Region, the results show 43%; 1%; 56% of the respondents are Married, Single, Widower /widowed respectively.

In the Centre Region, the results show that 65%, 31%, 3%, and 2% of the respondents were Married, Single, Divorced, Widower or widowed, respectively. In the three regions the results of the respondents shows that 49%, 19%, 6%, and 26% of the respondents are Married, Single, Divorce, Widower / widowed respectively.

Table 1. General information and socio-demographic characteristics of respondents

Variables	Terms	Centre	Littoral	West	Total
Age of head of household	Mean	36	53	41	
	Minimum	20	40	26	
	Maximum	51	65	66	
Household size of respondents	Mean	10	11	6	
	Minimum	1	2	1	
	Maximum	80	25	68	
Household sex	Man	42%	2%	43%	29%
	Women	30%	84%	43%	53%
	Missing	29%	15%	13%	19%
Marital status	Married	36%	29%	26%	30%
	Single	31%	1%	27%	19%
	Divorce	3%	0%	15%	6%
	Widower	2%	56%	19%	26%
	Missing	29%	14%	13%	18%
Level of education of the head of household	None	6%	0%	2%	2%
	Primary	12%	27%	3%	14%
	1st cycle secondary	25%	59%	1%	28%
	2nd cycle secondary	21%	9%	65%	32%
	Superior	11%	0%	17%	9%
	Missing	26%	5%	13%	14%

Source. Researcher

Market structure of Cassava

The market structure of cassava is described below based on the volume of sales from the market.

Wholesalers. The results of a pooled sample of wholesalers indicate similar trends as those in the retail market but the market is segregated, and the income gap is wider between groups. Specifically, the result indicated that marketers in the Center region within the sales range of 7,755–8,755 (which constituted 74% of the total respondents) earned 339,225 FCFA (USD565.4), and the Gini coefficient was 0.61. While marketers in the Littoral region within the sales range of 2,751–4,751 (which constituted 62% of the total respondents) earned 137,530 FCFA (USD229.2), and the Gini coefficient was 0.55. Marketers in the West region within the sales range of 2,750–3,750 (which constituted 58% of the total respondents) earned 46,705 FCFA (USD77.8), and the Gini coefficient was 0.35. This implies that the cassava wholesale market was perfectly competitive. This is reflected the existence of many small-scale producers and suppliers of the produce with the result that none of them could influence supplies by either increasing or decreasing the quantity supplied to influence price. The result of the analysis is similar to the findings of Mafimisebi *et al.* (2006) in the analysis of palm oil marketing in Osun state which shows a Gini coefficient of 0.47 indicating a low level of inequality in sellers' income levels.

The segregation within wholesaler markets is well depicted in the Lorenz curve of Figure 1. The curve highlights three kinks (inflection points), notably 20%, 40%, and approximately 80%, each associated with a market share. In this case, the bottom 20% corresponds to approximately 4% of the market share while the bottom 40% occupies <20% of the market share. The remaining 60% of the market is unequally split by the top 60%. From the 80% inflection point, the top 20% controls over 50% of the market share. These results indicate a higher within market inequality among wholesalers which is far higher than what is observed with retailers despite the pooled Gini coefficient results of Tables 2 and 3.

Table 2. Pooled Sample for Wholesalers

Category of sales	Frequency	Proportion of sellers (X)	Cumulative proportion of sellers	Amount	Proportion sold (y)	Cumulative proportion sold daily	X.Y
2750-3750	30	0.22	0.22	97190	0.13	0.13	0.028
2751-4751	40	0.29	0.51	166035	0.21	0.34	0.060
4752-5752	8	0.06	0.57	45820	0.06	0.4	0.0036
5753-6753	1	0.009	0.58	5800	0.009	0.409	0.000081
6754-7754	15	0.11	0.69	114580	0.15	0.559	0.01
7755-8755	43	0.31	1	331255	0.44	1	0.13
TOTAL	137	1		760680	1		0.24

Source. Field survey, 2022, $G = 1 - 0.24 = 0.76$, $HHI = 0.28$

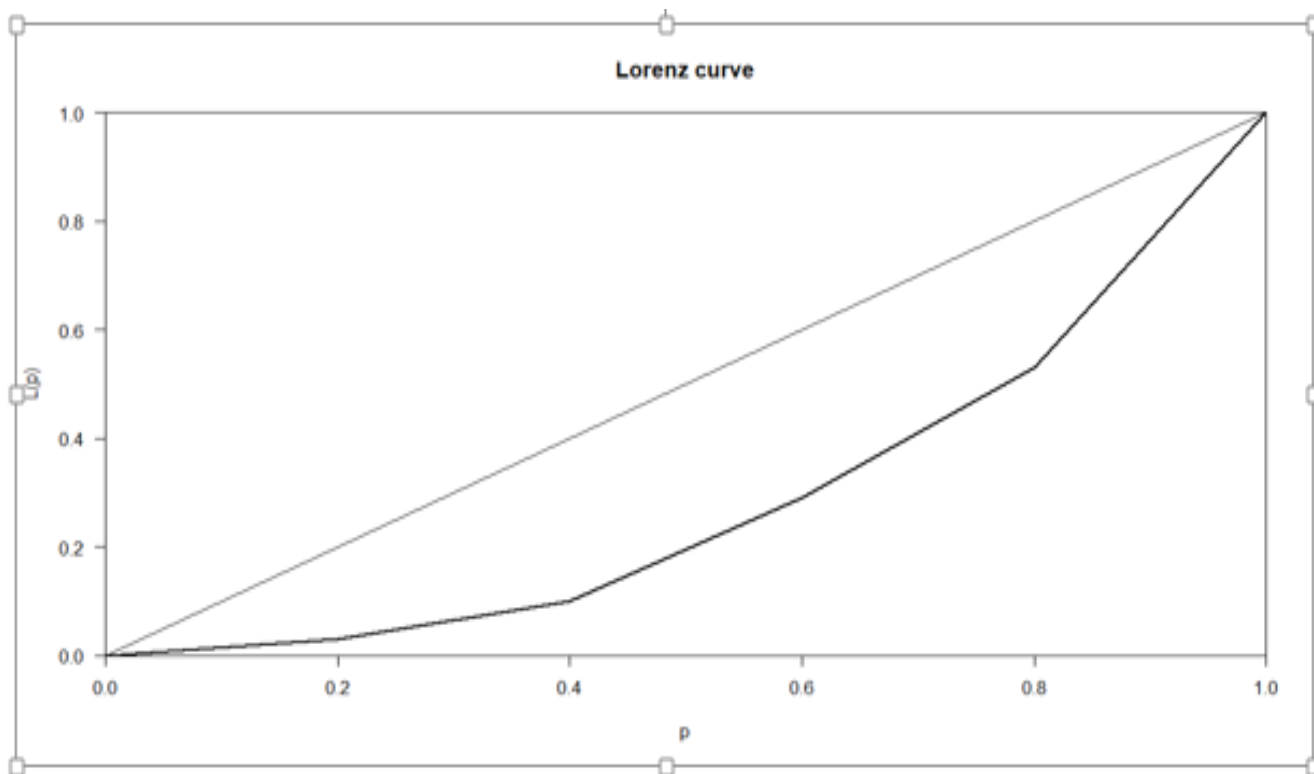


Figure 1. Lorenz Curve for Wholesalers

Retailers. The market power and structure of cassava markets are described based on the volume of sales from the market. The results in Tables 3, 4 show the volume of sales from the marketing of cassava. For the pooled retailers, the findings indicate that the cassava market is highly concentrated at the retail level, reflecting an uncompetitive condition. This may be the result of collusive practices in buying and selling and differences in the degree of risk involved in sourcing suppliers by different type of marketers. Although there was a relatively high income inequality in both markets, we observed that the level of concentration in retailing (0.79) was higher than in wholesaling (0.76). This finding is in line with those of previous studies (Haruna *et al.*, 2012; Ahmed *et al.*, 2018) which highlighted that the Gini coefficient >0.5 indicates an unequal distribution of sales among market participants. Specifically, the result indicated that marketers in the Center region within the sales range of 650–851 constituted 96% of the total respondents and earned 25,646 FCFA (USD42.7),¹ and the Gini coefficient was 0.12. Marketers in the Littoral region within the sales range of 1254–1454 (which constitutes 37% of the total respondents) earned 17,000 FCFA (USD28.3), and the Gini coefficient was 0.48. Marketers in the West region within the sales range of 450–650 (which constitutes 65% of the total respondents) earned 46,705 FCFA (USD77.8).

For the pooled sample analysis of retailers, the Gini coefficient was 0.93. This implies that the cassava retail market is perfectly competitive. That is, there are relatively many retailers in the market such that none of them had control over the largest portion of total sales.

The resulting Lorenz curve of Figure 2 depicts a similar equality scenario for retailers. The x-axis (highlighted as p) represents the percentage of market participants while the y-axis [indicated by $L(p)$] highlights the market share fraction occupied by these participants. The graph however shows that the level of inequality is higher for the bottom 30% of the market participants as compared to the top 70%. The kink effectively highlights this divide where we observe that the bottom 30% have access to < 10% of the market, whereas the remaining 90% of the market share is split almost equally between the top 70%.

This result supports the notion of an unequal market as presented in Table 3. Precisely, it highlights a new caveat of inequality in the bottom 30% of the retail markets, which was shadowed in the marginal analysis. The kink might also suggest a market trap (barrier) that prevents agents from taking advantage of the opportunities within the agri-food market.

Table 3. Pooled Sample for Retailers

Category of sales	Frequency	Proportion of sellers (X)	Cumulative proportion of sellers	Amount	Proportion sales (Y)	Cumulative proportion sales daily	X.Y
450-650	73	0.3	0.3	39685	0.26	0.26	0.078
651-851	53	0.27	0.57	38081	0.25	0.51	0.067
852-1052	2	0.11	0.68	2035	0.01	0.52	0.001
1053-1253	30	0.15	0.83	34352	0.23	0.75	0.034
1254-1454	26	0.14	0.97	33965	0.22	0.97	0.030
1455-1655	5	0.03	1	7520	0.03	1	0.0009
TOTAL	189	1		155 638	1		0.21

Source. Researcher

$$G = 1 - 0.21 = 0.79$$

$$HHI = 0.23$$

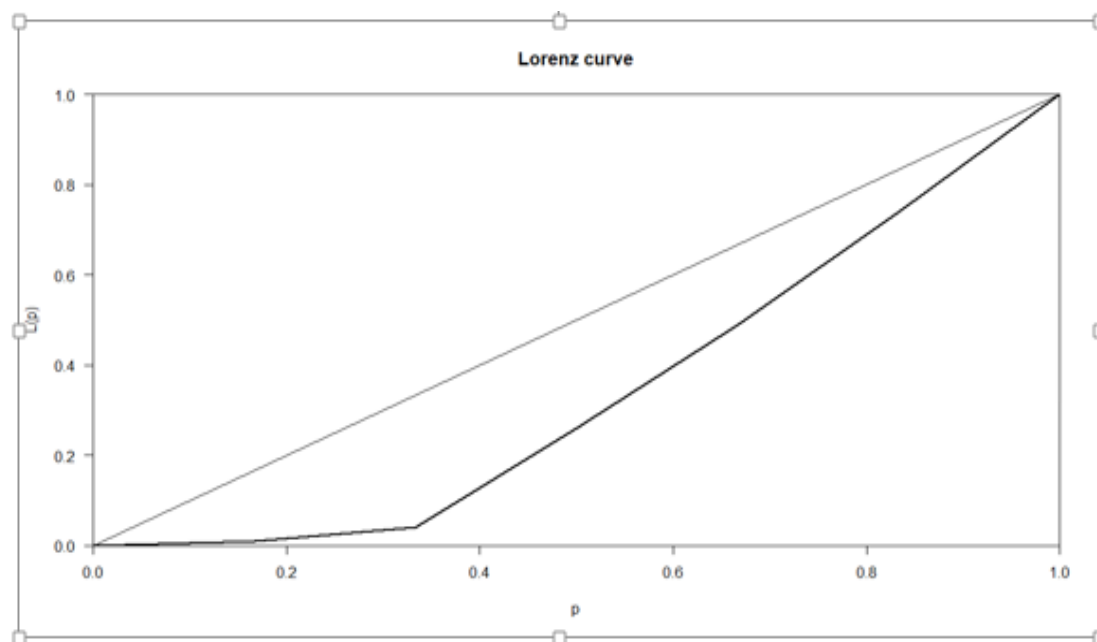


Figure 2. Lorenz Curve for Retailers

Market Performance for Wholesalers and Retailers

For wholesalers : The pooled findings show that the ME of wholesalers ranges between 0.87 and 8.22 with the average and standard deviation of 2.88 and 1.72, respectively. Specifically, in the Center region, our findings show that ME ranges between 3.16 and 8.22 with an average and standard deviation of 4.64 and 1.15, respectively. In the Littoral region, we observe that ME ranges between 0.87 and 1.91 with an average and standard deviation of 1.34 and 0.22, respectively, and in the West region, our findings indicate that ME ranges between 1.48 and 3.62 with the average and standard deviation of 2.2 and 0.62, respectively. Wholesalers are thus efficient despite existing market inequality. This finding is in line with Ojo *et al.* (2016) who reported marketing efficiency of tomato marketing as low as 24.87% and 10.07% in Abuja Municipal. Table 6 summarizes the results of the ME of wholesalers. Table 6 highlights a significant mean square difference for both retail and wholesale cassava markets. The mean square difference is significant for both the retailers and the wholesalers. This highlights the implicit difference in market structures of the studied regions.

For retailers : The pooled findings show that the marketing efficiency (ME) of retailers ranges between 1.42 and 6.31 with an average and standard deviation of 3.21 and 0.99, respectively. Specifically, in the Center region, findings show that ME ranges between 2.88 and 6.31 with an average and standard deviation of 4.42 and 0.73, respectively. In the Littoral region, findings show that ME ranges between 1.94 and 3.6 with an average and standard deviation of 2.76 and 0.43, respectively. In the West region, we find that ME ranges between 1.42 and 5 with the average and standard deviation of 2.90 and 0.89, respectively. The values indicate that retailers are efficient despite the challenges and unequal distribution of market shares among participants. Our findings corroborate the results obtained by Haruna *et al.* (2012) and Adegbite and Adejobi (2018) who analyzed tomato traders in Pwalugu in Ghana.

Conclusion

The results indicate that the market is dominated by economically active people with 63% of the vendors being women, in the active age group of 20–65 years. The educational level of the vendors showed that 32% attended secondary school and 49% were married. Our findings equally highlight a highly concentrated wholesale and retail market with corresponding Gini coefficients of 0.76 and 0.79. This indicates that cassava markets in the Center, Littoral, and West regions are oligopoly in structure. Among other things, our results highlight that, the region, marketers' type (wholesaler or retailer), and socio-economic factors such as access to education, region of origin, marital status, access to credit source of income, group membership, and the type of cassava stock account significantly for the variation of odds to participate in either farmgate, village market, or central markets. Our results also reveal that prices are set up in the markets according to the place of sale and the type of marketers. However, these prices are influenced by factors such as transport, the quantity sold on the market, and the need for liquidity. In addition, cassava retailers are less efficient as compared to wholesalers with associated average marketing efficiency of 14.20% and 87% for retailers and wholesalers, respectively. Therefore, efforts at the market centers should be tailored toward reorganizing retailers into cooperatives and associated institutions. This might be an appropriate measure that will enable retailers to reap the benefits lodged within the cassava markets. This would also help them benefit from credit facilities from agricultural and commercial banks and micro credit financial institutions. Although to a limited extent, our results could benefit government agricultural market policies.

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