Transaction costs and marketing decision: a case study of smallholder tomato farmers in Makurdi, Nigeria

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(Received 20 November 2013; accepted 24 June 2014)

This study examined the impact of transaction costs and other institutional and socio-economic factors on smallholder tomato farmers marketing decision in Makurdi Local Government Area, Benue State, Nigeria. The study used a survey data from 165 randomly selected farm households. Using a Logit model, the study found that the probability of market participation is significantly affected by transaction cost variables (namely access to market information, market distance and transport cost). Education and dependency ratio also had significant effect on decision to sell in the market. While access to market information and education significantly increase the probability of tomato farmers’ participation in the market, transport cost, market distance and dependency ratio significantly decrease the probability. The study stresses the need for government intervention by means of providing the necessary infrastructures that will help to reduce transaction costs and thus increase farmers’ participation in the market. Also policies to provide adequate and timely information about the market situations as well as polices to enhance access to education are advocated.

Keywords: transaction costs; market; participation; farm gate; smallholder farmers

Introduction

Despite the high oil revenue, agriculture is still one of the most important sectors of the Nigerian economy. Agriculture contributes over 40% of Nigeria’s GDP, employs about 70% of the population and produces about 80% of the food needs (Aye, 2013). Although, agriculture still accounts for about 88% of non-oil export earnings, its contribution has seriously declined over the decade falling from about 75% of total export earnings in the 1960s to less than 3% currently, though it is still a major source of raw materials for the country’s agro-based industries (Oji-Oko, 2011). About 30.7 million hectare (76 million acres) or 33% of Nigeria’s land area are under cultivation (Encyclopaedia of the Nations, 2012). Benue State, the case study area has been acclaimed to be the ‘food basket of the Nation’ because of its relative position in food production with over 23,000 square kilometres of arable land and 80% its entire population involved directly in subsistence farming (Ministry of Information and Orientation, 2012). Despite these potentials, poverty is still on the high side in Benue State with approximately 65% living below the poverty line (Akighir, Ngutsav, & Asom, 2011). This implies that the farmers are not getting optimum economic return from their agricultural products, since agriculture is expected to contribute to poverty reduction. The poor turnover from agriculture in Benue State has

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been attributed to several factors including poor soil management, lack of adequate support from the government in terms of policies and provision of inputs like fertiliser, lack of standard unit to sell, poor marketing scheme, lack of storage facilities and lack of processing factories, among others (Gani & Adeoti, 2011).

Nigeria in general and Benue State in particular produce both cash and food crops including yam, cassava, sorghum, millet, sweet potato, peanut, palm oil, sugarcane, soybean, cocoa, coffee and many other fruits and vegetables like tomato, carrot and cabbage, etc. However, this study focuses on the tomato enterprise. Tomatoes are usually bulky and easily perishable and hence this motivates its choice in this study. Tomato is a very important crop in Nigeria as it is taken as part of the daily meal. Adekiya and Agbede (2009) noted that for Nigeria to meet the millennium development goal in food production, food including tomato must be readily available. Nigeria was ranked the 13th highest producer of tomatoes in the world, with 1,701,000 tonnes in August 2008 (FAOSTAT, 2012). Although, Nigeria in general, and Benue State in particular has a comparative advantage in the agricultural sector, especially in tomato production and processing, over 50% of the tomato produced in Nigeria is lost majorly through poor storage system and bad road network. Poor storage system and bad road network may translate into transaction costs which in turn affects the profitability of a farm.

The concept of transaction costs was first introduced by Coase (1937). However, he failed to provide an operational framework on this, thus the concept was neglected for a long time. Defining transaction cost is a bit complex and as asserted by Singh (2008) in de Silva, Ratnadiwakara, and Soysa (2008), there is no standard definition for it. Transaction costs are usually viewed as those costs which are associated with the act of exchanging ownership rights of economic assets (de Silva et al., 2008), which is, in this case, agricultural produce. Transaction costs includes information and search costs with respect to finding the price, quality, quantity and durability of the product, negotiation and contracting (legal) fees, communication charges, monitoring and enforcement costs among others (Jagwe & Machete, 2011). It can also include transportation costs. According to Natasha (2011), transaction costs will determine the net returns from market participation, and are, therefore, fundamental in determining whether a household participates or not.

Transaction costs can also be classified into observable and unobservable transaction costs (de Silva et al., 2008; Staal, Delgado, & Nicholson, 1997). The observable transaction costs include marketing costs such as transport, handling, packaging, storage, spoilage, etc. that are visible when a transaction takes place. Unobservable transaction costs include cost of information search, bargaining and enforcement of contracts, etc. As noted by Chowdhury (2003), transaction cost can also be classified as proportion transaction cost (PTC) or fixed transaction cost (FTC). PTC depends on the volume of trade, meaning that the cost is incurred in each unit of trade. However, FTC depends on the frequency of trade, meaning that the cost is incurred in each trading and hence invariant to the volume of trade. In reality, both types of transaction costs may be observed for a particular trade. In either case, each increases the price gap between sellers and buyers, hence reducing exchange. The distinction between PTC and FTC is however vital as it has implications for farm households’ decision to participate in the market. PTC impacts on the quantity supplied in the market once a farm household is already in the market, whereas FTC influences whether a farm household participates in the market or not (Chowdhury, 2003).

A number of studies have been conducted to investigate the effects of transaction costs on farmers’ market participation. For instance, Police (2004) examined the
relationship between transaction costs and participation in cattle market in Botswana and found that herd size and access to market information increased the probability of households to sell to Botswana Meat Commission (BMC) while grade uncertainty, distance to the market and the speed of payment decreased the probability to sell to BMC. Similarly, Montshwe (2006) determined the factors affecting participation in mainstream cattle market by small-scale cattle farmers in South Africa, and found that market distance, herd size, household size, dependants, dowry, theft, mortality, household assistance, training, market information, farming systems and remittances play significant role in the decision to sell in the mainstream cattle market. However, results based on simulations indicate a bigger role for training and access to information if initial conditions improve. Jagwe and Machete (2011) examined the impact of transaction costs on smallholder banana farmers in the Great Lakes Region of Central Africa and found that access to price information, collective action, gender of household head, geographical location and degree of dependence on the crop significantly affect the choice of selling point. Natasha (2011) worked on market participation of beans smallholder farmers in Zambia. The participation decision was modelled and estimated using a two-stage model involving a probit and a truncated regression. Model results show that the market participation decision among producers is a function of area planted, yield, wealth, alliances, transportation availability on the farm, location, age and educational level.

As far as Nigeria is concerned, few studies have also been conducted with respect to transaction costs and market participation. These include Okoye, Onyenweaku, and Ukoha (2010) on cassava farmers in South Eastern Nigeria and Ohajianya and Ugochukwu (2011) on sweet potato farmers in South Eastern Nigeria. Okoye et al. (2010) show that access to communication facilities, extension contacts, age, native of a community, road conditions to the nearest town, yield, membership of cooperatives or social organisations, farming experience and marketing experience were positively and significantly related to the decision to be autarkic other than buyer and seller. Further, education, distance to the nearest town, distance from the farm to the market and crop transportation were negative and significantly related to the decision to remain autarkic other than seller and buyer. Ohajianya and Ugochukwu (2011) found that marketing experience, farm size, membership of cooperatives/social organisations, extension contact, farming experience, road conditions to the nearest town, age, household size, output, access to credit, access to communication facilities and sex had positive and significant relationship with the decision to be autarkic other than buyer and to be seller other than autarkic. The coefficients for level of education, distance to the nearest town, distance from the farm to the market and cost of transportation were negative and significantly related to the decision to remain autarkic other than a seller and to be buyer other than autarkic.

Against this background, this study examines the impact of transaction costs and other socio-economic and institutional factors on farmers’ marketing decision. To the best of our knowledge, this is the first study that examines this relationship for Benue State, Nigeria. While there are a lot of studies on transaction costs in a number of countries, it is argued that transaction costs can differ from one country or region to the other depending on the condition of the road and communication networks, among other things. Since the level of transaction costs may differ by location, it is expected that the magnitude of its effect may also differ by location. More importantly, despite the expected role of transaction costs on marketing decision, there is no known study quantifying this effect for tomato farmers. The concerns about transaction costs may be more important for some enterprise than for others. Although bulkiness and perishability
are two common properties of agricultural produce, tomatoes in particular are highly 
bulky and perishable compared to most other vegetables and crops. This can contribute 
to the level of transaction costs and subsequent magnitude of impact on marketing deci-
sions. On this basis, this study is considered to contribute in terms of the location and 
specific enterprise considered. The rest of the paper is organised as follows: section two 
provides details on the data and empirical models used for analysis. In section three, the 
results and discussion are presented. Section four presents the conclusion.

Methodology

The data for the study was collected with the aid of structured questionnaire from 165 
randomly selected tomato farmers in Makurdi, Local Government Area of Benue State 
Nigeria. Data was collected on the relevant variables which included age, sex, farming 
experience, education, marital status, market participation, household size, credit, non-
farm work, tomato price, farm size, dependency ratio, road condition, personal transport, 
telecommunication and market distance among others.

Logit regression was used to identify the factors that affect farm households in 
deciding whether to sell their product at the farm gate or at the market place. The Logit 
model is specified as:

$$P_i = \frac{1 + \exp(Z_i)}{1 + \exp(-Z_i)}$$ (1)

Because Equation (1) is non-linear, one can linearise the model by taking the natural log. This gives the following linear Logit model:

$$L_i = \ln \left( \frac{P_i}{1 - P_i} \right) = Z_i = \beta_0 + \beta_1 X_1 + ... + \beta_{16} X_{16} + e$$ (2)

where \( \frac{P_i}{1 - P_i} \) is the ratio of the probability that a farmer will participate in the market to 
the probability that a farmer will not participate. Hence, the dependent variable is binary 
and its value is 1 for a farmer who participated in the market and 0 for a farmer who 
did not participate. As \( Z_i \) range from \(-\infty\) to \(+\infty\), \( P_i \) range from 0 to 1 and \( P_i \) is non-
linearly related to \( Z_i \). The following 16 independent variables were regressed on the 
dependent variable which is market participation.

- \( X_1 \): Transport cost
- \( X_2 \): Market information
- \( X_3 \): Educational (primary)
- \( X_4 \): Educational (secondary)
- \( X_5 \): Educational (tertiary)
- \( X_6 \): Farming experience
- \( X_7 \): Non-farm work
- \( X_8 \): farm size
- \( X_9 \): Age
- \( X_{10} \): Dependency ratio (the number of dependents below 18 years and above 60 years 
  per household of working age)
- \( X_{11} \): Distance from farm to the market (DFFM)
- \( X_{12} \): Road condition
- \( X_{13} \): Access to credits
$X_{14}$ personal means of transportation
$X_{15}$ Access to communication facilities
$X_{16}$ Tomato Price
$\beta_0$ Constant term
$\beta_i$ $i = 1, 2 \ldots 16$ = vector of parameters to be estimated (regression coefficients)
$e$ random or stochastic term

Six out of the sixteen variables included in the model are transaction cost variables namely: transport cost, market information, distance from farm to the market, road condition, personal means of transportation and access to communication facilities. The measurement and summary statistics of the variables are reported in Table 1.

### Results and discussion

This section presents the result from the Logit model on factors that influence market participation. The result is presented in Table 2. The log likelihood is statistically significant at 5% showing the overall model fit. This implies that transaction costs and farmers’ socio-economic characteristics are in general significant determinants of farmers’ participation in tomato market in Makurdi Local Government Area of Benue State Nigeria.

Out of the 16 explanatory variables that were included in the model, the result revealed that market information, education (primary), education(secondary), education (tertiary), farm experience, age, road condition, credit, personal transport, telecommunication and tomato price had positive influences on market participation of tomato farm households. While the other five variables, non-farm work, transport cost, farm size, dependency ratio and market distance had negative impact on market participation by households. The result of this analysis is in line with that of Police (2004), Natasha (2011), and Ohajianya and Ugochukwu (2011). However, only five of the sixteen variables were found to be statistically significant namely transport cost, education at tertiary level, dependency ratio, market distance and market information.

### Table 1. Measurement and summary statistics of variables used for analysis.

| Variable                        | Measurement                        | Mean  |
|---------------------------------|------------------------------------|-------|
| Market participation            | Participated = 1, otherwise = 0    | .88   |
| $X_1$ (transport cost)          | Naira                              | 7360.79 |
| $X_2$ (market information)      | Yes = 1, No = 0                    | .91   |
| $X_3$ (educational (primary))   | Yes = 1, No = 0                    | .28   |
| $X_4$ (educational (secondary)) | Yes = 1, No = 0                    | .28   |
| $X_5$ (educational (tertiary))  | Yes = 1, No = 0                    | .15   |
| $X_6$ (farming experience)     | Years                              | 12.44 |
| $X_7$ (non-farm work)          | Yes = 1, No = 0                    | .81   |
| $X_8$ (farm size)              | Hectare                            | .63   |
| $X_9$ (age)                    | Years                              | 39.98 |
| $X_{10}$ (dependency ratio)    | Number of people                   | .84   |
| $X_{11}$ (distance from farm to the market) | Kilometres                   | 13.56 |
| $X_{12}$ (road condition)      | Good = 1, Bad = 0                  | .36   |
| $X_{13}$ (access to credits)   | Yes = 1, No = 0                    | .11   |
| $X_{14}$ (personal means of transportation) | Yes = 1, No = 0                    | .35   |
| $X_{15}$ (access to communication facilities) | Yes = 1, No = 0                    | .87   |
| $X_{16}$ (tomato price)        | Naira/basket                        | 624.24 |
Transport cost is negative and significant at 10% level of significance though the coefficient is very small. It, therefore, means that an increase in transport cost decreases the probability of a household to participate in the market. An increment in transport cost will reduce the number of market participants. One saddening revelation from the field was that there was no tomato marketing union or platform on which tomato farmers can actually agitate for their needs or request, which is a major constraint on their path. Also due to the bad road network in most of the villages or towns in Makurdi Local Government Area, only a very few farmers transport their produce in lorries, cars, pickups and buses, but in some situations where the roads are bad and these vehicles convene their produce for them, the farmers are made to pay heavy transportation cost. However, most of the farmers transport their products through motorcycles, wheel barrows and head pans. The major drawback of this is that the quantity that can be transported is limited, thus leading to the loss of major part of the tomatoes produced.

The distance reflects how far household must travel to participate in the marketplace. This is also a transaction cost variable, as it has implication on the monitoring and enforcement of contracts. The result revealed that the relationship between distance to the nearest market and the probability of tomato farmers to participate in the market was negative and significant at 10%. The negative sign means that households closer to the market outlets are more likely to participate in marketing activities than households living farther away. Therefore, with a unit increase (say 1 km) in distance, the probability to sell or participate in the market will reduce. The result also showed that market information was positive and a significant determinant of the probability of farmers to participate in the market at 1% level. This implies that receivers of market information are more likely to participate in the market than non-receivers. Access to market information will help farmers analyse the market situation especially with respect to prices and level of demand for their produce and hence will most likely reduce the risk of

| Variables                        | Coefficient | Standard error | Z-statistic | p-value |
|----------------------------------|-------------|----------------|-------------|---------|
| Constant                         | 4.855**     | 2.674          | 1.816       | .054    |
| Transport cost (X1)              | −.000*      | 0.000          | −1.630      | .103    |
| Market information (X2)          | 3.255***    | .922           | 3.530       | .000    |
| Education (primary) (X3)         | .288        | .914           | .310        | .753    |
| Education (secondary) (X4)       | .508        | .831           | .610        | .541    |
| Education (tertiary) (X5)        | 1.612*      | .965           | 1.670       | .095    |
| Farm experience (X6)             | .058        | .059           | .990        | .324    |
| Non-farm work (X7)               | −.226       | .826           | −.270       | .784    |
| Farm size (X8)                   | −.669       | .702           | −.950       | .340    |
| Age (X9)                         | .017        | .033           | .510        | .613    |
| Dependency (X10)                 | −.740*      | .421           | −1.760      | .079    |
| Market distance (X11)            | −.101*      | .062           | −1.620      | .104    |
| Road condition (X12)             | .135        | .639           | .210        | .833    |
| Credit (X13)                     | .032        | 1.164          | .030        | .978    |
| Personal transport (X14)         | .247        | .284           | .870        | .383    |
| Telecommunication (X15)          | .425        | .871           | .490        | .625    |
| Tomato Price (X16)               | .006        | .007           | .850        | .395    |
| Log likelihood                   | −47.281**   |                |             | .038    |

*Statistical significance at 10% levels.
**Statistical significance at 5% levels.
***Statistical significance at 1% levels.
coming home with unsold produce or selling at undesirable prices which has implications for profitability.

The education variable revealed a positive relationship with the probability of household to participate in the market, but education was only statistically significant for the tertiary level at 10% level. The findings showed that the probability of market participation increased with the level of education. A unit increase in the level of education increases the probability to participate in market. Education should help a farmer to develop better skills and ability to analyse market situations. Therefore, it can be said that households headed by more educated people are better empowered to participate in the market. Dependency ratio was found to be negative and statistically significant at 10%. It, therefore, means that the higher the dependency ratio the lower the probability of the household to participate in the market. This may be explained by the fact that households with more dependants are likely to consume greater part of their produce and hence have little or nothing left for the market.

Conclusion
Smallholder farmers are mainly responsible for producing the nation’s food for many years despite the constraints they face. They actually face the greatest constraint after harvesting because they have to sell what they have laboured for throughout the season or else, be at a risk of losing the farm produce. This study, therefore, examined the impact of transaction costs and related factors on a farmer’s decision to participate in the market place using smallholder tomato producers in Benue State as a case study. Tomatoes are usually bulky and easily perishable and hence this motivates its choice in this study. When transaction costs are higher than the value or utility derived from such transaction, farmers may not want to trade. Transport cost, market distance, road condition, market information, access to telecommunication and personal means of transport were used as proxies for transaction costs. Other control variables were also included. The study used survey questionnaire in collecting primary data from a random sample of 165 tomato farmers. The Logit regression model was used in analysing factors that determine tomato farmers’ market participation. The findings in this study show that access to market information, transport cost, market distance, education at tertiary level and dependency ratio are statistically significant in determining farm households’ decision to participate in the market. Based on these findings, policies that guide the federal, state and local governments towards increased investment in rural infrastructure is recommended as this will help reduce transaction costs and thereby improve participation of smallholder farmers in the market. Further, policies aimed at enhancing farmers’ access to market information can also be useful in promoting market participation. Farm household should be encouraged and empowered to access educational institutions around them, in order to develop their skills better and hence enjoy the benefits of market participation. Overall, policies that are aimed at lowering transaction costs will help in promoting tomato production and hence agricultural growth as well as reducing poverty among rural households. Future research to elicit how transaction costs affects the quantity of tomatoes farmers will be willing to supply once already in the market may be useful.

Note
1. Detailed frequency distribution of farmers according these variables and other socio-economic characteristics of farmers are available from authors upon request.
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