Effect of Transaction Costs on Seller Decisions among Small-Holder Cassava Farmers in South-Eastern Nigeria

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10 August 2010

EFFECT OF TRANSACTION COSTS ON SELLER DECISIONS AMONG SMALL-HOLDER CASSAVA FARMERS IN SOUTH-EASTERN NIGERIA

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ABSTRACT
A linear probability model (LPM) analysis of seller decisions selling cassava on-farm (farm-gate) or off-farm (market) was derived and estimated consistent with a sample 216 farm households. Variables of proportional transaction costs have different effects on off-farm and on-farm market participation decisions. The seller type decision revealed that coefficients for have a personal means of transport, road conditions to the nearest town and marketing experience were positive and significantly related to increase in off-farm cassava sellers at 5% level of probability. The coefficient for distance from the house to the farm was negatively and significantly related to increase in farmers selling off-farm at 1% level of probability. The coefficients for crop transportation costs, distance to the nearest town, distance from the house to the farm and yield were negative and significant at 5% level of probability. These decisions to participate as an off-farm or on-farm seller were as a result of proportional transaction costs associated with participating in the market. It was found that unexpected transaction costs inhibit farm households from selling off-farm. The results therefore calls for policies aimed at infrastructural development especially on roads and establishment of bulking centers to mitigate transportation costs.

Keywords
Transaction Costs, Seller Decisions and Cassava Farmers

INTRODUCTION
Fresh cassava roots, with about 70% water content, are bulky and therefore expensive to transport especially over long distances. The roots are also perishable, and begin to deteriorate soon after harvest. These features are expected to have profound bearing on the trade network for the roots. For instance, the bulky nature of the roots makes the market for fresh roots more localized around the producing areas than the market for processed cassava products. Also the perishability factor makes the marketing process considerably shorter for fresh roots than other cassava products (Ezedinma *et al*., 2007).

Marketing can be a problem for poor farmers especially those living in villages with poor feeder roads who may not have resources to transport their commodities to the market. Typically, farmers transport cassava as Head loads, on Bicycles, or in Lorries. With poor market access, marketing cassava can be particularly problematic because of its bulky nature, especially unprocessed roots. Poor access also makes the movement of goods and people difficult; particularly during the rainy season. This has significant implications for marketing (IITA, 2004) To date, the literature has typically assumed that transaction costs are exogenously determined and has focused on the various ways that self-sufficiency affects behavior, especially with respect to production, insurance and credit (de Janvry *et al.,* 1991). Paradoxically, little research has been devoted to the study of transactions costs themselves (Fafchamps and Hills, 2005).

By examining how small cassava farmers sell their output, we hope to throw some light on the nature of transactions costs affecting farmers in poor countries. In contrast with farmers in developed countries who often have large farms and enjoy good institutions and infrastructure, most farmers in developing countries are very small, geographically isolated, and outside the reach of formal market institutions (Fafchamps and Hills, ibid). For them, interacting with the market is fraught with difficulty and danger, so much so that many opt for self-subsistence altogether (Key *et al*., 2000). The objectives of the study therefore are to describe the socio-economic characteristics of the on-farm and off-farm sellers as well as estimate the determinants of selling (on-farm and off-farm) for cassava producing households.

METHODOLOGY
Three out of the 5 states in the South-East Geo-Political zone were randomly selected for the study. They were Anambra, Abia and Enugu States. A multi-stage randomised sampling procedure was used to collect cross sectional data to identify factors of market participation among cassava producing households. Since each state is made up

of three agricultural zones each except Anambra State with four Zones, at such the second stage, two agricultural zones per state were randomly selected giving a total of six agricultural zones. In the third stage, two LGAs were randomly selected from each zone giving a sample of 12 LGAs. In the fourth stage, three communities were selected randomly from each Local Government Area giving a sample of 36 communities. In the last stage 10 household producers were randomly selected, giving a total of 360 respondents. Among the 360 cassava producing households were 216 net sellers (166off-farm and 50on-farm), 95 autarkic (neither buying nor selling) households and 49 net buyers (37off-farm and 12on-farm). This study dropped 144 households that are autarkic and buyers.

The Linear Probability Model (LPM) looks like a typical linear regression model but because the regressand is binary, or dichotomous, it is called a linear probability model. This is because the conditional expectation of Y_i given X_i, $E(Y_i/X_i)$, can be interpreted as the conditional probability that the event will occur given X_i, that is, Pr (Y_i = $1/X_i$) (Gujarati, 2004). Thus in our data, E (Y_i/X_i) gives the probability of being an off-farm seller or on-farm seller and whose X_i's are the independent variables.

The LPM poses several problems, which are as follows: non-normality of the disturbances ui, heteroscedastic variances of the disturbances and questionable R^2 as a measure of goodness of fit. These problems can be surmounted by (a) the use of Weighted Least Squares (WLS) to resolve the heteroscedasticity problem or increase the sample size to minimize the non-normality problem, (b) use of the Logit model, (c) and the Probit model (see Gujarati, 2004).The LPM was used because of the nature of the data set used in this study.

The LPM, which tests factors affecting the incidence of being an off-farm or on-farm seller of cassava, can be specified as follows implicitly:

$Y_i^{sellertype} = bo + b_iX_i + e$ …… (1)

Where:

$Y^{sellertype}$ is dummy variable for seller decision (1 = off-farm, 0= on-farm), i is number of observations, X_i is vector of independent variables, bi is vector of unknown coefficients and e is independently distributed error term.

Explicitly the seller type equation for cassava selling households was also modeled as follows;

$Y_i^{sellertype} = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + b_{10}X_{10} + b_{11}X_{11} + b_{12}X_{12} + b_{13}X_{13} + b_{14}X_{14} + e$ …….. (2)

Where;

X_1 is personal means of transportation (dummy variable; 1=yes, 0=no), X_2 is distance to nearest town (km), X_3 is distance from the farm to the market (km), X_4 is distance from the house to the market (km), X_5 is distance from the house to the farm (km), X_6 is amount of credit borrowed in Naira, X_7 is crop transportation costs (Naira/tonne), X_8 is household size, X_9 is dependency ratio (the number of dependents below 18 and above 60 per household of working age), X_{10} is road conditions to nearest town (dummy variable; 1=good, 0=bad), X_{11} is marketing experience (in years), X_{12} is farm income in naira, X_{13} is non farm income in Naira, X_{14} is Cassava yield (kg/ha), $b_1 - b_{14}$ are coefficients to be estimated and e is error term.

RESULTS AND DISCUSSION

The data in table 1 show the characteristics of cassava producers in South-Eastern Zone of Nigeria. Among the 216 respondents were 166off-farm and 50on-farm sellers. The size of cassava harvest and farm size varied considerably across households. All the respondents had small land holdings (2.3ha and 3.26ha for off-farm and on-farm sellers respectively). The average off-farm seller had an output of about 18.6t, sold 13.6t and consumed 4t. The on-farm seller harvested about 31t of cassava, sold 24t and consumed about 6t. The on-farm seller had the highest land holdings and may prefer to sell cassava at the farm gate as a result of huge transaction costs emanating from its bulky nature. Since most of the households were located in the rural areas, the nearest passable road on the average to the nearest town were 4.12km and 9.84km away for the off-farm and on-farm seller respectively. On-farm seller households were distantly (12.66km) located from their homes to their farms to 4.55km for their off-farm seller counterparts.

Table 1: Characteristics of Survey Households, by Market participation Status in South-East Agricultural Zone of Nigeria, 2010

Variable Description	Seller	
	Off-Farm	On-Farm
Proportional Transaction Costs Related		
% that have personal means of transport	33.85	16.00
Distance from the farm to market	6.19	12.48
	(2.34)	(5.61)
Distance to the nearest town (km)	4.12	9.84
	(1.51)	(3.07)
Distance from house to the market	6.48	10.47
	(2.08)	(4.24)
Distance from house to the farm	4.55	12.66
	(1.13)	(3.94)
Volume of Credit (N)	37,333.33	102,013.23
	(48,549.63)	(137,092.71)
Cost of transportation (kg)	3.74	
	(3.43)	
Household Size	5.62	5.51
	(1.44)	(1.57)
Dependency ratio	0.63	0.58
	(0.49)	(0.15)
Cassava Marketing experience in Years	20.95	7.13
	(15.44)	(4.41)
Farm income (N)	218,024.04	275,060.60
	(285,371.2)	(378,783.70)
% of Road conditions to the nearest town	46.98	48.00
Farm size (ha)	2.30	3.26
	(3.78)	(4.16)
Cassava Output (kg)	18,600.0	30,769.39
	(30,980.73)	(42,003.94)
Yield (kg/ha)	4,520.39	9,295.84
	(962.76)	(2,067.46)
Quantity Sold (kg)	13,491.70	24,288.95
	(4,858.65)	(6,448.58)
Non-farm Income (N)	110,074	213,448.30
	(123,161.20)	(197,688.00)

Survey Results, 2010; Numbers in parentheses are standard deviations.

On-farm seller households were also distantly (12.48km) located from their farms to the markets to 6.19km for off-farm sellers. This might also partly explain the longer travel and assembly time during the wet season. It also illustrates the *von* Thunen hypothesis. The more perishable and the higher value the products the less distance they are transported (Minten and Kyle, 1999). However, the main reason for the longer time was probably the fact that roads were worse and often impassable in the rainy season. It also took about N3, 740 to transport a tonne of cassava to the market. About 46.98% and 48% of the off-farm and on-farm sellers indicated that the road conditions were good respectively. About 33.85% of the off-farm sellers also had a means of transport.

Most off-farm (66.45%) and on-farm (56.31%) households relied on cassava sales for their major source of income. On average the income from cassava sales accounted for 55.15% of the total income. The respondents also borrowed about N51,000 being volume of credit for production activities with the on-farm sellers having the highest volume of N102,013.23. The off-farm sellers had more years (20.9) of marketing experience compared to the farmers selling on-farm (7.13years). This seems to be an indication of the high influx into this activity. This might be a reflection of the overall economic situation as entry into the market seems often driven by excess labor supply created by falling living standards and increasing formal sector unemployment.

Decision on Market Participation by Seller type (LPM)

The empirical results of the linear probabiliy regression estimates for market participation among on-farm sellers and off-farm sellers are shown in table 2. The chi^2 was highly significant at 1.0% level of probability indicating regression of best fit. The likelihood ratio tests indicate that the slope coefficient was significantly different from zero for seller decision. The coefficients for distance to the nearest town, crop transportation costs and distance from the house to the market were negative and significant at 5.0% level of probability. The coefficient of distance from the house to the farm was also negative and significant at 1.0% level of probability respectively. This indicates that increase in distance to the nearest town, from the house to the market, from the house to the farm and crop transportation costs will increase the number of on-farm sellers and decrease the number of sellers' off-farm.

Table 2: Results of Linear Probability Regression for Market Participation

Variable	Parameter	Coefficient	Std. Error	t-value
Have personal means of transport	a_{11}	0.4068	0.1601	2.5414**
Distance to the nearest town (km)	a_{12}	-0.0990	0.0495	-2.0162**
Distance from the farm to the market (km)	a_{13}	-0.0302	0.0433	-0.6974
Distance from the house to the market (km)	a_{14}	-0.114703	0.0579	-1.9782**
Distance from the house to the farm (km)	a_{15}	-0.2655	0.0721	-3.6803***
Volume of Credit (N)	a_{16}	8.73e-06	6.54e-06	1.3348
Cost of transportation (N/kg)	a_{17}	-0.0003	0.0001	-2.3382**
Household Size	a_{18}	-0.0286	0.0635	-0.4576
Dependency ratio	a_{19}	-0.2360	0.5926	-0.3982
Road conditions to the nearest town	a_{20}	0.8895	0.4079	2.1806**
Marketing experience	a_{21}	0.0205	0.0081	2.5148**
Farm income (N)	a_{22}	3.72e-06	2.99e-06	1.2409
Non farm Income (N)	a_{23}	-7.82e-06	7.33e-06	-1.0666
Yield (kg/ha)	a_{24}	-0.0036	0.0014	-2.5556**
Constant	a_0	1.7881	0.1872	9.5543***
Log likelihood		-79.8119		
chi^2		0.0002		
Pseudo R^2		0.5720		

LPM; on farm seller = 0, off farm seller = 1. *, ** and *** = Significant at 10%, 5% and 1% respectively

As expected, the results suggest that those households located far away to the nearest town, from the house to the market and to the farm were more likely to sell their cassava on-farm. This contention is plausible since farmers in the rural areas do not have easy access and up to-date information about the markets, for the simple reason that functional extension offices and some marketing institutions were located in these towns. Increased distance to the market and farm also pre-disposes the farmer towards on-farm sales because of huge transactions costs involved in traveling long distances emanating from in-accessible roads. This also tends to increased crop transportation costs. When the infrastructure is poor, farmers are generally discouraged to use it. And those who do use the infrastructure experience high costs (Makhura *et al*., 2001). Binswanger *et al*., (1993) conclude that ''the major effect of roads is not via their impact on private agricultural investment but rather on marketing opportunities and reduced transaction costs of all sorts''. The coefficients for personal means of transport and marketing experience were positive and significant at 5.0% level of probability. These imply that increase in personal means of transport and marketing experience will increase the number of off-farm sellers. This is expected because farmers with more marketing experience will prefer to take their produce to the market where they may make better price bargains. The coefficient for yield was negative and significant at 5.0% level of probability. This implies that increase in yield will lead to a corresponding decrease in off-farm sales and increase in on-farm sales. This may be because of the huge PTCs associated with traveling to the market and house from the farm by the farmers. The on-farm sellers had long traveling distances from the farm to the market (12.48km), nearest town (9.84km), from the house to the market (10.47km) and from the house to the farm (12.66km). The farmer may therefore prefer to sell in the farm to mitigate these costs. The coefficients for distance from the farm to the market, volume of credit and farm income were positive but not significant. The coefficients for household size, dependency ratio and non-farm income were negative but also not significant.

CONCLUSION

This article shows that reductions in transport and/or transaction costs provoke changes selling decisions among cassava farmers in South-Eastern Nigeria. Policy efforts should enhance the production capacity through the provision of land. The development infrastructure especially roads would make a difference in the economics of the marketing behaviour of these farmers. Surfacing unpaved routes makes the most critical period for food availability in the shortage regions by reduction in travel time and easy accessibility especially during the rainy season. Such developments could further provide opportunities for private sector development in the rural areas.

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