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Determinants of Transaction Costs to Farmers Participation in Groups from Mbozi District in TanzaniaDeogratias Lwezaura⁸ and Deus Ngaruko⁹**Abstract**

Farmers are often encouraged to form producer groups to facilitate their access to markets in an effort to overcome transaction costs and enjoy economies of scale, which is often advocated in the collective action literature. The role of transaction costs in participation of smallholder farmers groups is attempts that underpin the present paper. The study uses a cross-section data of a sample size of 310 farmers collected from Mbozi District of Tanzania. They include variables capturing transaction costs on farmers' participation in groups. A model that can be used to capture elements of transaction costs while explaining influences for farmers' participation in groups is specified and used in the analysis. Variables capturing transaction costs explaining decisions costs (including information gathering, contracting and negotiating) of farmers to participate in groups are demonstrated and used in the analysis. In light of transaction cost literature only three variables that show significant effect include registration fee or cost of joining a group, distance that captures access to a group meeting place and membership to a market oriented group. Based on the findings, we conclude that policies focusing to lowering transaction costs through improved transportation, lowering participation fee and promotion of marketing oriented farmer groups would increase farmers' decision to participate in groups and increase group participants.

Keywords: transaction cost, farmers' group participation, logit models

1.0 Background

In order to fully integrate farmers to markets it is important to choose the appropriate governance structures that minimize such cost. Many authors (Romanik 2008; Bienabe *et al.*, 2004; Ngaruko, 2010) have encouraged the creation of farmer organizations as a means of overcoming the above problems. The advantage of organizing farmers into groups include among other factors a reduction in the transaction costs of accessing input and output markets as well as improving the negotiation power of smaller farmers vis à vis large buyers or sellers (Hayes D., 2000). For example, Divine, (2009) report on the approach used by Cameroon, which imposed a law on common initiative groups and cooperative societies enacted in 1992 as a response to market liberalization which ignited the process of forming producer groups. Tanzania has not been serious to follow this approach, only that most of the government initiated loans and other community development initiatives are channeled through groups. Probably, this approach can encourage farmers or community members to form or join groups, despite having theoretical support for producer groups. However, efforts towards this as an appropriate structure to link producers to markets, as also reported in Shepherd (2007); producer group formation as structures to solve marketing problems has had mixed success to date. We discuss this further shortly.

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The objective of the present paper is to determine the role of transaction costs in participation of smallholder farmers groups. We review the literature and show that transaction costs parameters have had been incorporated into agricultural household model framework to analyze market participation of smallholder farmers in various commodity markets. It has involved postulating that the objective of household is to maximize utility subject to a set of cash and resource constraints. The models have included variables that capture transaction costs that affect farmer participation in markets. The theoretical framework incorporates the assumption that households face large transaction costs in group operationalization which influence farmers' decision to participate conditional upon their entry into the groups. In this regard, Key et al. (2000) identified two types of transaction costs: fixed and proportional transaction costs. Fixed transaction costs are assumed to determine household's decision whether or not to enter into the market, or in this particular study to participate in groups. Often the problem is that high fixed transaction costs can result in market failure in which case the households fail to enter into the groups. For example, we argue that, high transaction costs due to lack of transport and communication infrastructure, distance to group meeting centre can make it costly for the farmers to access information on opportunities and hence fail to participate in groups.

1.1 Transaction costs insights

The concept of transaction costs is derived from New Institutional Economics (NIE) in the work of Coase (1937). Several literatures have defined "transaction costs" as the costs incurred by participants in an exchange in order to initiate and complete the transactions. Though, various econometric analysis have used transaction costs as dependent variables to a set of independent variables, but the analysis in the present paper is on reverse direction. That means, what are considered as set of transaction cost indicator variables are treated as independent variables affecting the decision of a farmer to join a group, see also in Barham, 2008, Foti, et al., 2009). To put description of transaction costs a bit forward, we may consider a hypothetical example. Consider buying rice from a store: to purchase rice, your costs will be not only the price of the rice itself, but also the energy and effort it requires to find out which of the various rice products you prefer, where to get them and at what price, the cost of traveling from your house to the store and back, the time waiting in line, the effort of the paying itself, and cost of searching for information. Thus, the costs above and beyond the cost of the rice are the transaction costs.

Now going back to the focus of the study, the need to look at transaction costs and their effects on the participation of smallholder farmers in rural setting is of great importance if the objective of transforming substance agriculture into commercialized agriculture is to be met. For instance, in the writing of Von Braun., 2008, documented that intensification of agricultural production systems and increased commercialization must be built upon establishment of well-functioning markets by way of collective actions that keep transaction costs low, minimize risks and extend information to all actors including farmers organized in groups, traders. These, findings are relevant particularly to this study because farmers will have achieved bargaining power for their factor and output markets if they are organized in groups – thus reducing transaction costs.

Approaches and methods used by Goetz (1992), Key et al. (2000) and Makhura et al., (2001), have made fair attempts to look at transaction costs and their effects on the participation of smallholder farmers. Several literature on transaction costs as is particularly relates to an organization are well documented in Ngaruko (2010), Badstue (2004), Williamson (2000), and Hobbs (1997). Though much of the literature attempted to look at transaction cost in related to markets of commodities and organizations, this study deviates from that construct and investigates with relation to farmers in group participation in the mainstream of market coordination failure. This, to the level of our knowledge might have been given little attention to explaining the role of transaction costs in explaining the farmers' choice between joining and not joining a group.

2.0 Methodology

2.1 Data collection methods

The present paper is based on a study conducted in Mbozi District in the Southern Highlands of Tanzania the year 2011. The district was selected because it is among the agricultural potential districts with concentrations of farmers' groups (FGs). Nineteen villages were covered with cross-section data from a sample of 310 farmers¹⁰. Farmers' selection was purposive to ensure interviews are conducted to those in groups and non-group members. Thus, for the purpose of this analysis that also accords the specified model requirement we selected both farmers participating in groups 205 (66%) and no-participants 105 (34%). The data were collected using semi-structured questionnaire administered on face-to-face interview arrangement.

2.2 Empirical model specification

In the present paper, a model of farmers' decision to participate in groups is developed to incorporate transaction costs. It model include variables that capture the effects of transaction costs on the participation of farmers in groups. Before, going into analytical issues with reference to the present paper, below is a brief review of transaction cost in the overall theory of transaction cost economics (TCE) which underpin this study.

2.2.1 Measurement and estimation procedures

A review of literature advances that a farmer's decision to join a group or not is influenced by a multitude of factors: socioeconomic characteristics at the household/farm level, production and group characteristics, transactions costs, as well as personal attitudes towards and experiences with the existing groups in the communities. In order to compare the effects of transaction costs on the participation of smallholder farmers in the groups, a bivariate probit and logit analysis can be used. Going further, a comparison of the marginal effects leads to deductions about the differences in the effects of transaction costs. As revealed in several literature, the fact that both logit and probit are cumulative distributive functions means that the two have similar properties. However, as documented in several publications, the biggest

¹⁰ The sample size was determined adopting published Tables in Glenn D, Israel (2009).

difference between the two is that Logit uses a variant of cumulative logistic function (CLF) while probit is based on the cumulative normal distribution (CND). Since, probit is based on the normal distribution, it's quite theoretically appealing (because many economic variables are normally distributed), though with extremely large samples, this advantage falls away, since maximum likelihood procedures are shown to be asymptotically normal under fairly normal conditions (Studenmund, 2000). For this paper we use logit model. The regression equation that is therefore specified as:

$$\text{Prob}(\text{MEMBOR} = 1) = \gamma_{1+e} - Z_j \quad (1)$$

$$Z_j = \sum_{j=1}^n x_j \beta + \mu_{1j} \quad (2)$$

Where

- MEMBOR= a dichotomous dependent variable (1 if participation takes place, 0 otherwise),
- x_j = independent variables which affect farmers income and those capturing transaction costs for the j^{th} observations;
- β = coefficient estimates of the independent variables; and
- μ_{1j} = the error or disturbance term for the regression equation.

By assuming that the response probability is linear in a set of parameters, the Logit model is expressed as:

$$\ln\left(\frac{D_i}{1-D_i}\right) = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_k X_{ki} + \mu_i \quad (3)$$

Where $\beta_0, \beta_1, \beta_2, \dots, \beta_k$ are denoted as estimated coefficients (including for those variables capturing transaction costs; X_1, X_2, \dots, X_k denoted as independent variables with β_0 as intercept and D_i denoted as probability of event (1, 0), which in this treatment is a dummy variable, where as ε is error term or disturbance with zero mean and constant variance.

The logit model assumes that there exists an underlying regression relationship between the dependent variables, group participation (MEMBOR), and a set of independent variables which include those capturing transaction costs. The variable MEMBOR takes on the values 0 or 1 whereby MEMBOR = 1 represents the farmer who joined a group in the reference period. The definition of variables used to capture transaction costs are as presented in Table 1.

The first variable, which represents a positive time cost to be borne by a farmer in order to participate in a group can be taken to proxy his/her opportunity cost in terms of loss of family welfare. The other variables represent cost of joining a group (COSTJO), distance or village distance away from a farmer to the group convening place (DISTANCE), time taken to be

approve to join a group (DAYSJOIN) and whether a group is of agricultural marketing type (TYPEGRO). Poulton et al., (2006) argued that belonging to a group empowers farmers to bargain and negotiate for better trading terms. A positive relationship between variable TYPEGRO and farmers' participation is, therefore, expected. Others are conditions to join an organization (CONDIGO) and information solicitation and sharing (SOINFARG).

Groups are important platforms for information exchange among farmers, especially in places with weak physical infrastructure. A positive relationship between this variable and participation is, therefore, expected. Based on dataset available these are the variables that are considered as proxies for transaction costs and they are used in the logit estimation together with other farmer characteristics such as age, sex, education. This process contributes directly towards examining the effects of transaction costs on the discrete decision of smallholder farmers to participate in groups.

Table 1: Definition and values of independent variables

Independent variable	Definition	Value / dummy
Sex	Sex of respondent	1=male, 0= otherwise/female
age	Age of the respondent in years	continuous variable
condjo	if there are condition to join a group	Dummy, 1=yes, 0=no
asestoin	Total assets of a respondent	Value are continuous presented as asset index
distance	Village distance – distance in km from a respondent to group meeting place – measure of transportation costs	Continuous variable
Soinfrad	Radio as source of information –access to information – as measures to search for information	Dummy, 1=male, 0=otherwise
typegro	Type of group which is related to marketing – a measure of access to markets	Dummy, 1=male, 0=otherwise
Bicown	Farmer ownership of a bicycle -	Dummy, 1=male, 0=otherwise
costjo	Cost of joining a group in Tshs. (registration fee) – captures contracting costs	Continuous variable

3.0 Results and Discussion

3.1 The effect of transaction costs in group participation

This section outlines the estimation procedures used in examining the effects of transaction costs on the farmers' decision of participating in groups. In this analysis, the underlying regression is to determine the relationship between group participation (DMEMBOR1), a dummy and a set of independent variables which affect the participation. Specific variables capturing transaction costs are included among independent variables and a regression analysis catering for selectivity bias is performed to obtain coefficient estimates. The independent variables capture aspects related to transaction costs such as distance to group convening area (DISTANCE), cost of joining a group (COSTJO) which is continuous variable, sources of group information (DSOINFRAD1) as dummy and collective action which affects bargaining position, marketing group (DTYPEGRO1) as dummy and conditions imposed by groups for a farmer to be able to join (DCONDIJO1). Other variables that are included together with transaction cost capturing variables are age of the farmer in years (AGE) and sex of the farmer (DSEX_1), a dummy.

The variable distance, which refers the distance to the group meeting place, is included in the analysis to capture the extent of isolation of farmers and level of access to the group convening place. While considering the fixed transaction costs associated with searching for a trading partner, negotiating bargaining, contracting, the variables related to market group ((DTYPEGRO1) was included in the analysis. Pulton et al. (2006) argued that belonging to a group empowers farmers to bargain and negotiate for better trading terms. Joining marketing group would be important for social relations and networks of members in shaping their economic actions. Marketing group, therefore, is important platforms for information exchange among farmers, especially in places with weak physical infrastructure. A positive relationship between marketing group and a decision to participate in group is therefore, expected.

The variable SEX is included in the analysis to capture the gender aspect with respect to group participation. For instance, an analysis by Barham et al., (2008), Foti, at al., (2009) provides evidence by arguing that men are likely to break a deal more due to their natural ability to bargain and negotiate contracts. A positive relationship with group participation is also, therefore, expected for this variable. The dummy variable a farmer owning a bicycle was included to assess farmers' ease of transportation to the group convening place as transaction cost variable to capture for information search in regarding group participation. Access to transportation equipment reduces the costs associated with transportation and is therefore to positively influence group participation. Therefore, it is used as a proxy variable (BICOWN) for costs incurred by farmers in search of information. A positive relationship is expected between owning a bicycle and group participation.

Thus, a binary response model for analysis of the effects of transaction costs on the group participation is then performed. This process would contribute directly towards examining the effects of transaction costs on discrete decisions of smallholder farmers to participate in groups - transaction costs indeed have an effect on the decision-making processes of farmers whether to join or not join a group.

The estimation procedure provides numerical approximations for the maximum likelihood estimates of β , and the values of the partial derivatives of participation with respect to the explanatory variables. The logit model is run to determine the coefficient estimates of the underlying regression equation and the selection equation using STATA 11 software. Transaction costs and the farmer's decision to participate in groups are examined. The decision is based on the benefits obtainable while taking into consideration the costs and risks involved. The marginal effects obtained in this analysis are thus interpreted accordingly. The independent variables range from those capturing transaction costs to those which capture the institution costs that include distance to the nearest group, access to market information, membership to a market oriented group and possession of means of transport.

Once the model was run, and in light of transaction cost literature, the results show that out of the eight variables used in the model, only three were significant determinants of farmers to participate in groups (Table 2). Generally, the estimated coefficients have expected signs. The marginal effect for a given independent variables is evaluated at the means of all other independent variables. The associated standard errors and statistical significance levels for the estimated coefficients are also given. Intuitively, one would expect that probability of participation would be higher for a farmer to have membership to a market oriented group. In the contrary the results show that the probability was lower to joining market oriented groups than other groups. However, this would be expected, if assessing the characteristics of the groups studied as most of them were associated with credit and saving schemes. This would imply that probability of farmers participating in groups whose main objectives is to provide credit and savings services have higher probability of choice. The results also show that the probability of men participating in groups is lower than women, though it was not significant.

In light of transaction cost literature only three variables that show significant effect include registration fee or cost of joining a group, distance that captures access to a group meeting place and membership to a market oriented group. When a farmer joins a group, he or she pays registration fee. The cost of joining a group was found to be having a significant positive effect. This is contrary to the *priori* that farmers would be hesitant to join a group if there is registration fee or if cost of joining is high. It is also contrary, for instance, in Foti et al. 2009, who found that there is a significant negative effect on farmer inclination to join pest management groups.

The farmers' membership in marketing group is found to be strongly but negatively associated with the likelihood of farmer to participate, which may be contrary to the general thinking that farmers will be highly inclined to a group if it is market oriented. The other relevant independent variables capturing transaction costs such as conditions imposed to join, radio as source of information and farmers owning a bicycle had no significant effect to group participation. Loosely concluded, the implication of this is that smallholder farmers can also participate in groups without much of the influence to these variables.

Table 2: Logit model estimation of transaction costs

Variable	Coefficient	Marginal effects (dy/dx)	S.E
Age of the respondent	-.109635*	-.1096735	.924582
Sex of respondent	-1.957301	-1.957301	.483871
if there are condition to join a group	.9609079	.9609079	1.895749
Village distance	6.248389*	6.248389*	2.826876
Radio as source of information – access to information	2.074615	2.074615	1.871841
Type of group which is related to marketing	-11.03744*	-11.03744*	4.909966
Farmer ownership of a bicycle	-2.432672	-2.432672	2.794953
Cost of joining a group in	6.639291*	6.639291*	3.066947
Constant	1.788085		3.769622
Log likelihood	= -10.614531		
Number of observations	= 173		
LR Chi-square, df=8	= 217.90		
Prob> Chi-square	= 0.000		
Pseudo R-square	= .9112		

Key: dy/dx is for discrete change of dummy variable from 0 to 1

marginal effects after logit: $y = \text{Linear prediction (predict, xb)} = -1.8447103$

4.0 Conclusion and Policy Implication

The paper has briefly reviewed literature on transaction costs. Measurement and estimation procedures used have been outlined. They include variables capturing transaction costs on farmers' participation in groups. We add to the empirical literature by specifying a model that can be used to capture elements of transaction costs while explaining influences for farmers' participation in groups. The conclusions based on model estimated coefficients are made. Based on the findings, we conclude that lowering transaction costs through improved transportation, and participation fee and promotion of marketing oriented farmer groups would increase farmers' decision to participate in groups and increase group participants. The chapter has contributed though rudimentary, to development of interventions that will make functioning of farmers' groups more efficiently for all participants.

The dimensions of TCE attempted to give an insight as important aspect for thoughts in farmers' groups' participation in the mainstream of collective action initiatives. These results confirm that transaction costs have hindered farmers to participate and even participate effectively in groups as relates to collective action initiatives. Therefore, in any group formation initiatives there would be a need for painstakingly assessment of potential parameters that are likely to lower transaction costs. However, the investigation does not extend its scope to include an analysis of the functioning of the individual farmers in groups, which would be of relevance approach regarding farmers' intentions to maximize utility subject to a set of constraints (high transaction costs). This approach would be able to link backwards to the positive participation response that would result when transaction costs are lowered and group operationalization becomes more effective. The research from this approach would be expected to lead to the development of interventions that will make smallholder farmers groups more efficient.

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