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ABSTRACT

While government of Uganda and its development partners are targeting farmer groups as the vehicle for agricultural development, there is limited empirical evidence on what drives membership to these groups. Using the Uganda Census of Agriculture 2008/9 data, this paper reveals low levels of membership both at individual and household levels with a marked regional dimension. The key policy variables found to influence participation in farmer group included education attainment, distance to extension service and quality of road infrastructure.

Increasing membership to farmer groups requires government and its development partners to target more resources towards less educated farmers and those who live far from extension workers. The use of the local language in publicity materials is also important in ensuring participation among the illiterate and the less educated. Overall, there is a need for concerted efforts by all institutions supporting groups to ensure that existing groups have improved access to agricultural technologies and noticeable outcomes are achieved so as to attract more farmers.

Key words: *Farmer group Membership, Decision Making, Uganda Census of Agriculture*

1. INTRODUCTION

Following the structural adjustment programmes of the mid-1980s, in which several Sub-Saharan Africa governments relinquished support to state controlled co-operatives, farmer groups have emerged in the policy agenda to fill the institution vacuum (FAO 2010).Uganda is one of those countries with a long history of such farmer groups (see for example, Kyazze 2010; DENIVA 2005a). These are avenues in which smallholder farmers can be reached by the government, the private sector and the development partners to improve agriculture productivity and improve food security. Different terminologies in literature are used to refer to farmer groups including producer organizations, farmer organizations, groups of co-operative action, or private co-operatives organisations (Asante *et al*. 2011; Aligum*aet al.* 2007; Uliwa and Fisher, 2004; Rondot*et al.* 2001). This paper[1] refers to them as farmer groups for as long as there was an element of co-operative action on any agricultural activity along the value chain.

Overall, farmer groups are important avenues through which farmers can access market and credit information as well as other important agricultural information like new agriculture technologies. They also form important avenues for mobilizing farmers around a common objective especially in delivery of services and formulation of policies that support agriculture development. In countries such as Tanzania and Ghana, farmer groups are at the centre of the poverty reduction strategy, extension delivery and crop marketing (Uliwa and Fischer 2004; Salifu*et al.* 2010).

In Uganda, the use of farmer groups remains central to the agriculture transformation process. The five year Agriculture Sector Development Strategy and Investment Plan (DSIP) has four pillars: (i) enhancing production and productivity; (ii) improving market access and value addition; (iii) improving the enabling environment for agricultural sector; and (iv) institutional strengthening in the sector (Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) 2010). Under Pillar one and two, the existing farmer groups are envisioned to play a key role in improving produce marketing, increasing access to financing and value addition and ultimately leading to agricultural transformation (MAAIF 2010).

As an example, the National Agricultural Advisory Services (NAADS) has its implementation strategy based on the farmer group concept. Farmers are supposed to join existing groups or form new groups within the village and then merge to form the village farmer forum. NAADS uses these groups for recruitment, selection of food security enterprise and distribution of multiplied planting and stocking materials is done. However, there is limited understanding of the drivers of individual's farmer participation in such groups.

1 This paper builds on the initial poster by the same authors in preparation for presentation at the International Association of Agriculture Economist 2012 Triennial Conference, *Foz do Iguaçu, Brazil 18- 24 August 2012.*

A complete understanding of factors influencing membership to farmer group could go a long way in informing policy, researchers and development practitioners on how membership can be enhanced and be relied on as channels for agriculture transformation. While there are various organizations and programmes that are supporting the formation of farmer groups in Uganda, the available literature seem to have focused on particular programmes such as NAADS groups and farmer field school (FFS) groups.

Benin *et al.* (2008) for example examined the factors that affect household decision to join the NAADS farmer groups. Davis *et al.* (2010) on the other hand examined the factors that influence the household's decision to participate in FFS groups in East Africa including Uganda. However, besides the NAADS groups and the FFS, other umbrella associations such as the Uganda National Farmers Federation (UNFFE) and the Uganda Cooperative Alliance (UCA) have farmer groups at the grass roots levels that coordinate farmers.

Unlike previous studies that have focused on a specific farmer group and also using unrepresentative data, this paper employs the Uganda Census of Agricultural (UCA) of 2008/2009 to provide insights into factors that drive farmer's decision to join any farmer groups.

The rest of the paper is organized as follows: review of related studies relevant to this study is presented in section 2. The data and methods used in the study are presented in section 3. The results and discussions are provided in section 4 prior to conclusions and policy implications in section 5.

.2. REVIEW OF RELATED STUDIES

Farmer groups have been formed to facilitate access to better agricultural technologies (Gibson *et al.* 2008); to improve access to better earning markets for produce (Aligumae*t al.* 2007); facilitate produce transport to markets (Mwaurae*t al.* 2012); for financial security and household investments (Mutoro 1997); access to credit where groups members acts as collateral for each other (Loevinsohne*t al.* 1994); to invest in agricultural value addition and milk processing plants (Mbowae*t al.* 2012); in infrastructural development e.g. rural roads, small power generation projects, schools and health facilities (UN 2010) and also in natural resources management and conservation (Nyakaana and Edroma 2008).

In other developing countries such as Senegal, farmer groups represent one of the success stories mainly because of the existence of an organized institutional framework with the existence of several federations such as Federation of NGOs in Senegal (FONGS) and National Council for Rural Dialogue and Cooperation (CNCR) (Rondot2001). By 2000, FONGS had 24 regionally based associations made up of about 2000 village groups with a membership of 400,000. About 20 percent of the national population was directly affected by the grass roots activities of FONGS. Both FONGS and CNCR support farmers through providing technical support and credit from farmer savings. One of key programmes that boost these farmer groups are long term learning by doing programmes which involve a union of Senegalese rural leaders of farmer organization. It involves the leaders meeting three or four times a year to discuss their experiences and receive feedback as a way of improving the performance of their groups. Rural leaders in the community are more likely to have a significant influence in encouraging participation in farmer groups even in the absence of external support ensuring that these groups are long lived and independent (Salifu*et al.* 2010).

Ghana is also one of those countries where farmer groups are widely used in agriculture development under the Ministry of Food and Agriculture. In 2007, there were over 10,000 farmer groups although they had an average existence of 4.5 years (Salifu*et al.* 2010). Registration of farmer groups is developed at grassroots level and these are registered at the local, district, and regional levels to a national apex. In addition, there exists the millennium development authority, a public agency that provides training to farmer groups and facilitates investments in business opportunities with farmer based organizations (Asante *et al.* 2011). Salifu*et al.* (2010) found that membership in farmer groups in Ghana appeared greatly homogenous in terms of income and assets and most appeared to have emerged from a pre-existing and well defined social cluster or network. Participation by farmers in these groups was mainly in anticipation for government and non-governmental support rather than an initiative of the community. Their major conclusion was the need to introduce long term learning by doing programmes involving rural leaders as is the case in Senegal. In determining

the factors that affect smallholder farmers to join farmer based organizations in Ghana, Asante *et al.* (2011) found that farm size, farming as a major occupation, access to credit and access to machinery services influenced farmers' decisions to join farmer based organizations in the Eastern Region of Ghana. Their major conclusion was that, there is need to increase the availability of credit and the timely provision of machinery services to increase membership to farmer groups.

In Tanzania, an assessment of producer organizations in the country established that there were over 6,000 active farmer organizations with over 250,000 members as of 2003 (Uliwa and Fisher 2004). The plausible explanation for this drastic increase may be explained by the favourable policy environment including a Ministry of Marketing and Co-operatives that is intended to guide the activities of farmer groups. Farmer groups are used as avenues for which smallholder farmers can market their produce, access inputs and get extension advice and are characterized by a higher proportion of male members and those producing export crops with high income. Various government and non-governmental organizations support these groups.

Successful interventions have been those that encourage participation by identifying markets and then recruiting groups of farmers to produce those commodities, usually in out-grower schemes like that implemented by FAIDA MaLi under the USAID fund (Uliwa and Fisher 2004). A combination of such out-grower schemes and interventions that are aimed at building stronger farmer groups through training of farmers on financial management and leadership would go a long way in encouraging participation and retaining farmers in the groups.

In trying to establish why some farmers do not join farmer groups particularly FFS in Uganda, Davis *et al.* (2010) found that lack of information reported by 53.2 percent was the major cause, followed by lack of time and commitments elsewhere (reported by 21.3 percent).

DENIVA (2005a)'s assessment on the effectiveness of farmer groups as viable institutions for farmer empowerment and poverty reduction in Uganda pointed out that farmer institutional development by the NAADS programme was given a low budget at that time. At the beginning of the NAADS program in 2001, spending was concentrated on management and coordination (e.g. 39 percent in FY2001/2), advisory and information services to farmers (35 percent in FY2001/2) and farmer institutional development (16 percent in FY2001/2). Over the years, spending has tended to focus more on farming technology development and monitoring and evaluation compared to farmer institution development (Benin *et al.* 2008). These could explain the low participation of farmers in groups in Uganda. In addition, stringent requirements seem to have limited farmers from joining farmer groups. Benin *et al.* (2008) found that at least 91 percent of the entire farmer groups reported that membership fees was a group eligibility requirement.

Lapple and Van Rensburg (2011) noted that acceptance to participate in farmer's group and adoption of any other agricultural technologies have similarity in that both follow Roger's innovation adoption curve. According to roger's adoption curve, adoption of any new idea is gradual with five categories of adopters. In case of a new idea, the first to adopt are the innovators representing 2.5 percent of the population. They are followed by early adopters, early majority, late majority and laggards each representing 12.5, 34, 34 and 16 percent respectively of the population (Roger 2003).

Literature reviewed identifies education levels of the household head, participation in nonfarm activities, age, gender, household size, distance to tarmac road, farm size and regulations as some of the potential factors that would influence the decision of households or individual to participate in farmer groups (Davis *et al.* 2010; Benin *et al.* 2008 ; Sabates-Wheeler 2006; Towo 2004).

With regards to gender, findings from research work done for groups in Tanzania and farmer field groups in Uganda varied with some showing that women participation is still lower than that of men while others found otherwise (Towo 2004; Benin *et al.* 2008). Towo's (2004)work on the relationship between gender and farmer groups in Tanzania found that women participated less in farmer groups than their male counterparts and attributes it to several factors. First, lack of sensitization on gender issues and the heavy domestic workload that women bear makes it difficult for them to attend group formation meetings; second, groups'focus on export crops in which women involvement is less because they lack control to key production inputs necessary for production like land; and third lack of deliberate efforts to mainstream gender in rural farmer groups through the formulation of pro-gender policies.
On the other hand, the DENIVA (2005b) on the assessment of the effectiveness of farmer groups as viable institutions for farmer empowerment and poverty reduction found that there were more female members to some of the NAADs groups than their male counterparts. Initially, there was a higher enrolment of males in anticipations of free inputs but later dropped out once their expectations were not realised. The impact evaluation of NAADS in Uganda by Benin *et al.* (2008) did not find any significant differences in participation in NAADS groups between male and female headed households. Davis *et al.* (2010) in looking at the impact of FFS on agriculture productivity and poverty in East Africa found a 50 percent probability of women being members in the FFS in Uganda.

With regards to education levels, Davis *et al.* (2010) found mixed results. While household heads in Kenya with primary and secondary education were more likely to participate in groups (farmer field schools (FFS)) than their counterparts with no education, the reverse was observed for Uganda. Yet, Benin *et al.* (2008) in looking at the factors that influence the decision for households to join NAADs groups found that farmers with some post-primary

education, are more likely to participate in NAADS groups, suggesting that efforts to build capacity of farmers to demand advisory services should be supported by programs that help farmers to improve their education. Indeed, the role of education in influencing farmer group participation in Uganda still has mixed findings given that it could enhance participation or discourage participation in groups.

Mixed findings are also noted with regard to life cycle. Younger farmers were more likely to participate in FFS groups than the older farmers in Uganda, Tanzania and Kenya (Davis *et al.*2010); whereas Benin *et al.* (2008) found insignificant results on the decision of a farmer to participate in a NAADS farmer group. Morgan (1988) in a study on age differences in social network participation found that after controlling for resources such as education and health, the network size of an individual increases initially with increase with age, remains relatively constant at ages 35-39 and then declines at an increasing rate after 75. Similarly farmer group participation which entails networking skills given the interactions of an individual with other farmers is likely to follow a similar trend.

The asset value (equipment and land) of the household or farmer is also an important factor that may influence the decision of a farmer to participate in a farmer group. Sabates-Wheeler (2006) in her study on local strategies for survival and growth in Romania and Kyrgyz Republic found that households with less land, labour, arable area owned and equipment were more likely to join groups than their counterparts who owned more land, labour and equipment. Participation in groups was an avenue for these less endowed households and individuals to be able to achieve higher levels of production and manage risk. This is contrary to the findings by Davis *et al.* (2010) in Uganda. They found that land size was positively related to the propensity to participate in FFS. The differences in participation of farmers in the two countries may be attributed to the differences in targeting. In Romania, targeting was towards those farmers poor in resources such as land which may not have been the case in Uganda.
Access to infrastructures such as the tarmac road and the market has also been shown to influence membership to farmer groups. Davis *et al*. (2010) for example found that distance to tarmac roads was negatively related with the propensity to participate in a FFS in Kenya and for all three East African countries combined, suggesting that farmers in remote areas are less likely to take part in the FFS. In Uganda, however, the farther the distance to the tarmac road the more likely an individual will participate in a FFS while in Tanzania distance to tarmac roads had no significant impact on the likelihood of participation. Regarding the distance to the market or urban area, the same study found that distance to nearest market/urban area was positively related to the propensity to participate in FFS in all countries combined and for Kenya and Tanzania. The case for Uganda was contrary - that is, farmers closer to urban areas were less likely to participate in an FFS than those in remote areas.

Considering household size as a likely factor that would influence membership to a farmer group, Davis *et al.* (2010) found that larger household sizes in Kenya were less likely to participate than smaller households. In Uganda and Kenya, the impact was not significant. The dependency ratio (the ratio of the number of dependents divided by the number of working adults) was negatively associated with participation in FFS groups in Uganda; households with a large dependency ratio were less likely to participate. Given that households with a higher dependency ratio are more likely to be poor than those with a lower dependency ratio, the results showed that these groups excluded the poor in Uganda.

Similarly, Friis-Hansen *et al.* (2004) in studying smallholder technology development in Soroti: a synergy between NAADS and FFS found that although members of NAADS and FFS had a significantly higher technology adoption and use, they were not accessible to the poor farmers and adoption was significantly higher for well off farmers. The study found that the poverty level of non-members of FFS was three times that of members of the group and attributed this to the self-selection process that was common during FFS group formations. The study also pointed out that NAADS groups were formed hurriedly with an external impetus and that mobilization through local government seemed to appeal to the progressive, elite leaders while the poorer sections of the population such as female headed households were excluded.

3. DATA SOURCES AND EMPIRICAL MODEL

3.1 Data Sources

This study employed data from the Uganda Agricultural Census (UCA) of 2008/2009 collected by Uganda Bureau of Statistics in collaboration with MAAIF. The census survey was conducted between the months of September 2008 to August 2009 covering 80 districts but focusing on agricultural households. A two stage sampling technique was used to identify households. The first stage involved choosing 3,606 Enumeration Areas (EA) from the four geographical regions namely the Northern, Eastern, Central and Western Uganda. At the second stage 10 households were selected from each selected EAs translating into 31,340 households.

The Census captured information on the agricultural household and holding characteristics including information on the demographic characteristics of household members as well as structural type of data on the agricultural holding; crop area including information on holding parcel and crop plot areas; and (iii) crop production information including quantities production at parcel level by crop. Households were visited twice during the survey period (UBoS 2008).

3.2 Empirical Model

This paper postulates that the i^{th} individual's decision to be a member or a non member of a farmer group (Y_i) is influenced by individual farmer characteristics and household characteristics where a farmer is resident (X_i), and village level characteristics (Z_i) that may promote or impede access to information about group formation. In addition, geographical location represented by regional dummies (R_i) may influence membership to these groups. The error term ε_i is included in the equation to take care of any other factors that might not have been included in the model but may influence farmer's decision to join or not to join a farmer group. The response probability in such a case is expressed as in Eq. (1).

$$P(Y_i = 1|X_i) = G(\alpha + \beta_i X_i + \gamma_i Z_i + \delta_i R_i + \varepsilon_i) \quad (1)$$

The function G may take on a linear function in which case it is known as a linear probability model (LPM). LPM may be appropriate for capturing the expected values of farmer group membership but it has some drawbacks such as producing predicted probabilities that are less than zero or greater than one, it implies a constant marginal effect of each explanatory variables that appear in its original form and it contains heteroskedasticity (Wooldridge 2009). However, this ceases to be a problem in large samples through the use of robust standard errors. To ensure that the explanatory variables take on the values between zero and one, the function G in Eq. (1) is either a standard normal cumulative distribution function for a Probit model or a logistic function for a Logit model.

Three estimation methods were employed including the LPM, the Logit and the Probit model. Estimation of the probit and logit models was by maximum likelihood which is indispensible for limited independent variables given that it automatically accounts for heteroskedasticity (Wooldridge 2009).

Description of the model variables

a) *Dependent variable* (Y_i)

UBoS collected information on membership to any farmer group during the past 12 months prior to the interview. This information was collected for only those individuals aged 15 years and over. The individual is assigned a value of 1 if he/she was a member at that time; otherwise he/she is assigned a value of zero.

b) *Individual and household characteristics,* (X_i)

Individual farmer characteristics include: age, age squared, and gender, education attainment, marital status and major economic activities. Age is captured as a continuous variable and we introduce a square of the age variable to account for the effects of the life cycle course on participation in such social networks such as farmer groups. On the other hand, we include the household characteristics where an individual is resident. These characteristics include: household composition (household size and share of adults above 18 years), and total land holding (in acres).

c) *Village level factors,* (Z_i)

The infrastructure variables included: distance to the produce market (local and district), distance to feeder road, distance to all-year gravel road, and distance to extension service provider, local input shop, extension provider and nurseries.

d) *Sub regional dummies,* (R_i)

Sub regional dummies were included in the estimation to account for any differences that might arise due to agro-ecological issues, culture, and socio-economic status.

Other estimation and data issues we considered included: missing data, multicollinearity, outliers and sample weights. Missing data is a potential source of bias in survey data analysis, especially if the variable which has missing data is essential in the results outcome (The European Agency for the Evaluation of Medicinal Products 2001). One of the options is to drop respondents with missing information on the key variables in the analysis and adjust the weighting process, while the other is to impute or substitute a valid response for the missing value (Carson *et al.* 1995). Engels and Diehr (2003) and Kalton (1995) provide thorough discussions of approaches for inputting missing values in longitudinal data and cross-sectional

survey data, including deterministic (e.g. mean, median or modal values) and stochastic (e.g. random regressions) approaches. Of all the approaches, the deterministic approaches are rather common. In this paper, the missing data problem was overcome by replacing the missing data with the median values.

Outliers were addressed by transforming especially distances using logarithms to make them more normally distributed variables and in turn improve the performance of the regression (see Mukherjee *et al.* 1998). All estimates both descriptive and econometric estimates were weighted based on the sample weights provided by UBoS.

4. EMPIRICAL RESULTS

4.1 Descriptive results

This section presents a profiling of membership to farmer groups at both individual and household levels by selected socio-economic characteristics and geographical location. A household is said to be a member of a farmer group when atleast one of its household members belonged to any farmer group during the past 12 months prior to the interview.

4.1.1 Incidence of membership to farmer groups

The incidence of individual membership to a farmer group is presented in Table 1 while the incidence of household membership to groups is reported in Appendix 2. Nationally, only 9 percent of the agricultural households above 15 years of age reported being a member of afarmer group during the past 12 months prior to the interview. At household level, only 16 percent of households were members to a farmer group. No large differences in female and male membership to farmer groups were observed at individual level. Regionally, Northern region leads other regions at 11.8 percent and Central region lags at 5.8 percent. Yet, these regional averages conceal sub-regional variations as illustrated in the table. Table 1 further shows that married individuals were more likely to be members of a farmer group as compared to unmarried individuals. Notable in Table 1 however is that women who were divorced, separated or widows were more likely to belong to farmer groups (84%) than their male counterparts (16%).

Individuals whose main economic activity was agriculture (crop and non-crop) were more likely to be in farmer groups relative to their counterparts in other economic activities. The relatively higher incidence of individuals whose main economic activity is non-crop agriculture compared to their counterparts in crop agriculture could be explained as follows. Either farmer find it more fulfilling to join farmer groups whose intention is directed towards non-crop activities or it could also be that available government programmes or NGOs have their priorities directed towards non-crop activity. A study by Okoboi *et al.*(2011) on the economic and institutional efficiency of the NAADS programme revealed that longer term enterprises like dairy cattle, piggery and poultry were given priority and dictated upon to the NAADS farmers. Broadly speaking, the low incidence of membership is a concern on the effectiveness of the recruitment efforts of Government programmes such as NAADS and Northern Uganda Social Action Fund (NUSAF) which directly target farmers organised in groups.

Table 1: Incidence of membership to farmer groups by gender

	% total population 15 years and above			Proportion of those in farmer group who are 15 years and above.	
Sub-group	All	Female	Male	Female	Male
Uganda	8.6	8.4	8.8	48.9	51.1
Marital status:					
Never married	2.1	2.1	2.1	41.9	58.1
Married	12.6	11.3	14.0	44.6	55.4
Divorced / Separated / Widow	8.6	9.7	5.6	83.7	16.3
No stated	6.2	7.1	5.3	58.1	41.9
Main economic activity:					
Crop agriculture	11.8	11.2	12.5	50.4	49.6
Non-crop agriculture	13.9	13.2	14.3	33.0	67.0
Trader/artisan	9.6	8.7	10.0	26.8	73.1
Paid employment	7.5	8.0	7.3	32.3	67.7
Household work	5.4	5.8	4.2	81.5	18.5
No activity	2.2	1.9	2.4	41.8	58.2
Region:					
Central:	**5.8**	**5.6**	**6.0**	**48.9**	**51.1**
Kampala	6.0	8.0	4.1	63.3	36.7
Central 1	6.7	6.4	7.0	49.0	51.0
Central 2	4.9	4.6	5.2	47.4	52.6
Eastern:	**7.8**	**7.7**	**7.9**	**48.9**	**51.1**
East Central	5.6	5.6	5.7	48.7	51.3
Eastern	9.1	9.0	9.2	47.8	52.2
Northern:	**11.8**	**11.0**	**12.5**	**47.1**	**52.8**
Mid-North	13.5	13.1	13.9	47.8	52.2
North East	14.7	13.3	16.2	48.2	51.8
West Nile	8.0	7.1	9.0	44.8	55.1
Western:	**8.6**	**8.8**	**8.4**	**50.5**	**49.5**
Mid-West	7.3	7.0	7.6	47.1	52.9
South-Western	9.6	10.1	9.0	52.1	47.5
Number of Observations	94, 731	4219	4247	4219	4247

Note: Analysis done at individual level
Source: Authors calculation based on UCA 2008/09

Following the literature reviewed, the low membership to farmer groups may be explained by the lack of information,the low budgetary allocations to farmer institution development by the NAADS programme and the stringent membership requirements (Davis *et al.* 2010; Benin et al., 2008; DENIVA, 2005b)). Farmer groups in Uganda also appear to be at an early stage with only innovators and early adopters having enrolled (Lapple and Van Rensburg , 2011). The challenge to policymakers therefore is to ensure that the institution of farmer group effectively attracts the early majority, late majority and the laggards.

The findings in Table 1 reveal that Northern region had high membership to farmer groups in Uganda yet this region was highly affected by the 20 year old insurgency. This could be attributed to the surge of government programmes and international development agency

support that emerged in the pre- and post-conflict era in the region. The Government of Uganda embarked on several programmes in an attempt to try to rebuild and empower communities. These programmes some of which are still being implemented include: the NUSAF; Acholi Programme; Restocking Programme; and Karamoja Development Programmes. Other humanitarian organizations such as UNICEF and World Food Organization are also providing services to these people. The overall strategy for most of these programmes particularly in providing livelihood support and protection was to target the vulnerable people organized in groups. The NUSAF, for example directs support to organized groups that are implementing income generating activities such as apiary, zero-grazing, poultry, vegetable growing and marketing and grain milling.

Next we consider incidence at household level – defined as the proportion of households with at least one member belonging to a farmer group during the past 12 months prior to the interview. Incidence of household membership in farmer groups was estimated at 16 percent. However, the patterns across regions and economic activity mirror those observed at individual level (for details, see Appendix 2).

4.1.2 Comparisons of selected characteristics between member and non-membership to farmer group

Farmers who were members of farmer groups were more likely to be older, males, literate and with better asset portfolio and better access to credit (Table 2). It is further noted that these individuals were more likely to be residents in households with larger land size and higher composition of adults. The latter implies that the households were associated with higher labour force supply. The results in Table 2 further reveal significant differences the characteristics of the household heads with and without household members enrolled in farmer groups.

Table 2: Selected differences in characteristics by farmer group membership

	Membership status		
	Non-member	Member	t- statistic
Individual characteristics:			
Age, in years	36.0	40.5	16.7
% males	48.6	49.9	2.1
Years of schooling	5.5	5.5	0.2
Literacy rate, %	67.2	70.9	3.0
Manages a plot, %	58.8	83.2	26.7
Owns livestock, %	36.4	69.2	26.6
Access to credit, %	3.6	19.4	15.3
Household characteristics:			
Household size	6.3	6.6	2.8

Land undercultivation	0.9	1.2	3.6
Demographic composition:			
- Children <=5 yrs	12.1	12.5	0.9
- Children 6-17 yrs	29.9	34.2	7.0
- Adults 18-59 yrs	49.7	47.7	-2.6
Male headed, %	82.9	84.0	1.2
Characteristics of household head:			
Age, in years	44.8	45.3	
Years of schooling	5.1	5.8	
Literacy rates, %	66.2	75.8	

Source: Authors calculation based on UCA 2008/09

Next we consider whether there are significant differences between the two groups in terms of access to information. There is no doubt that access to information is important to agricultural households if they are to improve on their farming practices, access markets for both inputs and outputs and adopt new technologies that will ensure productivity increments. Regardless of membership status, it is evident from Table 3 that the major source of information on weather and credit facilities was through radio, followed by farmer to farmer (at about 12 percent for non-members relative to 10 percent for members). On the other hand, farmer to farmer was an important source for information on crop varieties and agriculture practises, with a higher incidence among those households without members in farmer groups. More notably, households with at least a member in a farmer group were more likely to cite NAADS and extension worker as a source of information on crop variety and agricultural practises compared to their counterparts without such membership.

With regard to information on pest and diseases and then marketing, farmer to farmer interactions was a major information source for all households followed by radio. Like in the previous cases, NAADS and the use of extension workers were reported more by those in groups compared to their counterpart households that are not in groups. Particularly, 21 percent of households with a member in a group reported NAADS as a major information source on pest and diseases compared to only 5 percent reported by those not in groups. Similarly, 11 percent of those in groups reported NAADS as a major information source on marketing information compared to only 2 percent reported by their counterparts not in groups.

Overall, households with no members in farmer groups were more likely to cite farmer to farmer as a main source of agricultural information -implying that informal networks are still strong within farming households and attempts to improve on them could go a long way in promoting growth within the agriculture sector. On the other hand, households with members in farmer groups were more likely to report formal source of agricultural information including NAADS and the use of extension workers.

Table 3: Main source of information related to agriculture by membership status

Source	Weather			Crop varieties			New agric. Practices			Farm machinery		
	Non-Member	Member	All	Non member	Member	All	Non-member	Member	All	Non-member	Member	All
Radio	84.8	86.6	85.1	41.2	27.9	39.0	38.7	22.2	35.8	46.2	31.8	43.7
Modern ICT	1.0	0.9	0.9	1.0	1.4	1.0	1.0	1.3	1.1	1.2	0.7	1.1
Farmer to farmer	12.3	10.0	11.9	45.4	30.9	43.0	42.3	26.1	39.5	33.5	26.2	32.3
NAADs	0.2	1.1	0.4	5.9	25.5	9.3	9.3	32.8	13.4	4.5	19.4	7.1
Extension worker	0.3	0.6	0.3	3.1	10.8	4.4	4.3	13.4	5.9	2.8	9.3	3.9
Others	0.6	0.2	0.5	1.8	2.4	1.9	3.0	2.8	2.9	6.5	8.0	6.7
Not stated	0.9	0.5	0.8	1.5	1.1	1.4	1.5	1.3	1.4	5.3	4.6	5.2
Est. HHHs '000	2,723.3	526.0	3,249.3	2,598.3	528.6	3,126.9	2,312.9	488.4	2,801.2	1,660.7	341.8	2,002.5
	Credit facilities			**Plant diseases/pests**			**Marketing**					
	Non-member	Member	All	Non-member	Member	All	Non-member	Member	All			
Radio	51.8	42.6	50.2	39.7	27.6	37.7	38.7	35.0	38.1			
Modern ICT	0.7	0.5	0.7	0.5	0.3	0.5	1.4	1.2	1.4			
Farmer to farmer	36.5	29.5	35.3	47.9	33.0	45.4	52.3	42.7	50.8			
NAADs	3.4	11.8	4.9	5.1	20.5	7.7	2.0	11.0	3.5			
Extension worker	1.6	8.2	2.7	3.5	15.0	5.4	1.4	5.9	2.1			
Others	1.8	2.5	1.9	2.2	2.4	2.2	1.6	1.5	1.6			
Not stated	4.3	4.9	4.4	1.1	1.2	1.1	2.5	2.7	2.6			
Est. HHHs '000	1,896.6	397.2	2,293.8	2,535.9	502.3	3,038.2	2,423.7	459.4	2,883.1			

Source: Authors calculation based on UCA 2008/09

The results in Table 4 show the incidence of agricultural input use by membership status. The use of agricultural inputs is important if productivity is to be enhanced. Farmer groups are known to be avenues that facilitate and link farmers to new technologies and production practises. It is evident that households with a member in a group were more likely to use modern agricultural technologies compared to their counterparts with no household member in group. With regard to use of local seeds, no noteworthy differences were observed across membership in farmer groups. However, it is important to point out that the most applied modern technologies were improved seeds followed by veterinary drugs and pesticides.

Table 4: Household: Membership by use of agricultural inputs during the past 12 months, %

	Membership to groups		
	Non-member	Member	All
Local seeds	93.5	94.2	93.3
Improved/Hybrid seeds	30.2	45.8	31.7
Organic fertilizer	24.1	35.7	25.3
Inorganic fertilizer	7.7	13.0	8.2
Pesticides: Herbicides	9.1	15.4	9.3
Fungicides	5.4	10.9	6.0
Pesticides	17.0	28.7	18.3
Other pesticides	6.7	11.2	7.3
Commercially prepared Animal feeds	3.4	6.0	3.7
Veterinary drugs	28.3	47.1	30.0
Insemination	1.9	2.8	1.9
Number of observations	25909	5212	31121

Source: Authors calculation based on UCA 2008/09

4.2 Econometrics model

Results of the LPM, Probit and Logit models are presented in Appendix 3.The coefficients of the models differ in magnitude but similar in direction –implying they speak the same language but at different levels. In this paper, we focus the discussion on the probit estimates –transformed into marginal effects and presented in Table 5. It is evident that individual characteristics including age, gender, marital status and education do influence a farmer's decision to enrol in a farmer group. Specifically, older farmers are more likely to join farmer groups compared to the younger farmers by a 0.9 percent probability. There are regional variations that ranged from 1.1 percent for Northern Uganda to 0.8 percent for Eastern region. Upon controlling for other factors, the results reveal that male farmers are less likely to be members relative to their female counterparts. This finding contrasts the descriptive statistics that seem to portray that males are more likely to join farmers relative to female farmers.

Education comes in as a very important factor influencing the farmer's decision to be a member of a farmer group. Similar results are reported by Benin *et al.* (2008).The results suggest that

the higher the education level, the higher the probability of being a member for all the regions. For Western region for example, the likelihood of an individual who has completed secondary education and above is more than three-times that of an individual who has only attained some primary education. This finding could imply that much as the majority of the farmers have less than 5 years of formal schooling, those with higher education levels are more likely to take advantages of the benefits that come with joining farmer groups. Given the low levels of education of the agricultural households, there should be deliberate efforts to build capacities of individuals in these households that will enable them to join farmer groups.

Table 5: Probit model estimates for determinants of Farmer group membership in Uganda (Marginal effects)

	Regions				
	National	Central	Eastern	Northern	Western
Individual characteristics					
Age	0.009***	0.009***	0.008***	0.011***	0.008***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Age squared	-0.083***	-0.083***	-0.080***	-0.110***	-0.075***
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]
Farmer is male	-0.008***	-0.004	-0.011***	-0.008	-0.004
	[0.00]	[0.00]	[0.00]	[0.01]	[0.00]
Marital status of the farmer (cf:Never married)					
Married	0.045***	0.019**	0.042***	0.047***	0.061***
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]
Widowed and not remarried	0.050***	0.016	0.042**	0.039	0.088***
	[0.01]	[0.01]	[0.02]	[0.03]	[0.02]
Divorced and not remarried	0.023*	-0.001	0.009	0.032	0.028
	[0.01]	[0.01]	[0.02]	[0.03]	[0.02]
Married but separated	-0.011	-0.022*	0.001	-0.032	0.001
	[0.01]	[0.01]	[0.02]	[0.03]	[0.02]
Education level of the farmer (cf:No education)					
Some primary	0.035***	0.023**	0.018**	0.035***	0.028***
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]
Completed primary	0.064***	0.055***	0.065***	0.070***	0.037***
	[0.01]	[0.01]	[0.01]	[0.02]	[0.01]
Some secondary	0.097***	0.064***	0.076***	0.127***	0.071***
	[0.01]	[0.01]	[0.01]	[0.02]	[0.01]
A lever and higher	0.137***	0.086***	0.144***	0.148***	0.103***
	[0.02]	[0.03]	[0.03]	[0.04]	[0.03]
Main economic activity of the farmer (cf:crop agriculture)					
Non crop agriculture	0.012	0.007	-0.011	0.082***	-0.022
	[0.01]	[0.01]	[0.02]	[0.03]	[0.02]
Trader/Artisan	-0.027***	-0.024**	-0.021	-0.012	-0.042***
	[0.01]	[0.01]	[0.01]	[0.03]	[0.01]
Paid employment	-0.034***	-0.031***	-0.022	-0.044*	-0.045***

	Regions				
	National	Central	Eastern	Northern	Western
	[0.01]	[0.01]	[0.02]	[0.02]	[0.01]
No major activity	-0.075***	-0.021	-0.071***	-0.125***	-0.065***
	[0.01]	[0.02]	[0.01]	[0.03]	[0.02]
Home activity	-0.048***	-0.032***	-0.043***	-0.050***	-0.058***
	[0.01]	[0.01]	[0.01]	[0.02]	[0.01]
Household activities					
Share of Adults >18 years	0.032***	0.029**	0.014	0.023	0.046***
	[0.01]	[0.01]	[0.02]	[0.02]	[0.01]
Household size	0.001	0.002**	0.001	0.001	0.004***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Log of land size	0.021***	0.010*	0.036***	0.015	0.007
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]
Infrastructural access					
Logarithm of Distances (Km)					
Local produce market	-0.002	-0.008	0.006	0.014	-0.006
	[0.00]	[0.01]	[0.01]	[0.01]	[0.01]
District produce market	0.010***	0.002	-0.006	0.013	0.015**
	[0.00]	[0.01]	[0.01]	[0.01]	[0.01]
Local input shop	-0.005	-0.011**	0.003	-0.014*	-0.016**
	[0.00]	[0.01]	[0.01]	[0.01]	[0.01]
Extension worker	-0.011**	0.015**	-0.020***	-0.007	-0.013
	[0.00]	[0.01]	[0.01]	[0.01]	[0.01]
Nurseries	0.002	-0.013**	-0.010*	0.030***	0.001
	[0.00]	[0.01]	[0.01]	[0.01]	[0.01]
Feeder road	0.005	0.003	0.003	0.026*	-0.009
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]
All year gravel road	0.018***	-0.009	0.037***	0.010	0.020**
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]
Sub regions (cf:Kampala and Central1 combined)					
Central2	-0.031***				
	[0.01]				
East Central	-0.032***				
	[0.01]				
Eastern	0.026*				
	[0.01]				
Mid-North	0.084***				
	[0.02]				
North East	0.216***				
	[0.05]				
West Nile	0.019				
	[0.01]				

	Regions				
	National	Central	Eastern	Northern	Western
Mid west	0.011				
	[0.01]				
South Western	0.038***				
	[0.01]				
Pseudo R squared		0.078	0.0897	0.0798	0.07
Predicted probability at x-bar		0.089	0.055	0.123	0.089
Observations	68,378	11,202	21,258	16,595	19,323

Notes: ***, ** and * indicates statistical significance at 1, 5 and 10 %level. Regression is at individual level.

Source: Authors calculation based on UCA 2008/09

Generally, farmers in economic activities other than crop agriculture and non-crop agriculture such as traders or those in paid employment as would be expected are less likely to be members of a farmer group. In Northern Uganda, farmers whose main economic activity is non-crop agriculture have 8 percent more likelihood of being in groups than their counterparts who are in crop agriculture. This may be attributed to the fact that the major economic recovery programmes in Northern Uganda such as NUSAF prioritize non agricultural enterprises more than crop agricultural enterprises through provision of improved breeds and the control of livestock diseases (Gou, 2010). The lifecycle and household composition matters for one to join the farmer groups. Agricultural activities are associated with intensive labour demands. Results from Table 5 show that Individual farmers resident in households with a higher share of adult members are more likely to join the farmer groups. However, there are variations across regions as shown in Table 5. The finding is not significant for individuals in Eastern and Northern regions – which are the same regions that were part of the NUSAF project at the time of the Census.

The total land owned by the household is also an important factor influencing membership to a farmer group at national level and in Central and Eastern Uganda. However, it is an insignificant factor in influencing membership in Northern and Western Uganda.

Access to infrastructure mainly in terms of distance to extension worker also affects the decision to join the group sat national level but varies amongst regions. At national level, those far away from an extension worker are one percent less likely to join a farmer group compared to those close to the extension worker. In Eastern Uganda, those far away from an extension worker are about two percent less likely to join farmer groups. In Central Uganda, positive and statistically significant relationship between distance to the extension worker and membership to farmer group is observed. It is not clear why this may be the case, but may be related to better road infrastructure in the region.

The distances to all year gravel road and the district produce markets show that the further away a farmer is from these infrastructures, the more likely they will join groups. Davis *et al.* (2010) also finds contrasting results in terms of distances to urban areas and membership in FFS in Uganda.

Finally, there also exist sub regional differences in the likelihood of farmers being members of the group within the different regions when compared to Central 1 and Kampala sub regions. The presence of government programmes such as the PRDP and NUSAF and the sprouting up of Non Governmental organizations following post conflict period may explain the variation and significance of farmer group membership in the northern sub-regions compared to Central 1 and Kampala. In addition, the low membership to farmer groups in the combined two sub regions of Central 1 and Kampala may be associated with the fact that access to agricultural services like input shops is within easy reach of farmers such that they become reluctant to join the groups. It could also be attributed to the fact that these are regions where the capital city is located with substantial proportion of the population having formal employment and not agriculture as their primary source of income. They may therefore have a lower desire and time to join farmer groups.

5. CONCLUSIONS AND POLICY RECOMMENDATIONS

Using data from the Uganda Census of Agriculture of 2008/09, this paper has provided insights into the factors that influence the individual farmer's decision to join farmer groups. Despite the benefits that come with belonging to farmer groups, 9 percent of the adult farming population in 16 percent of the agricultural households were members of farmer groups. The observed rather high level of membership to groups in Uganda's lagging Northern region is partly attributed to the government interventions through NUSAF and NAADS programs. The level of membership to groups remains low if government intends to use this institution (farmer group) as a vehicle for transforming agriculture in Uganda. More importantly, this finding questions the effectiveness of the approaches used by both Government and NGOs to lure farmers to join and be retained in groups. The challenge is to ensure that this institution effectively attracts the early majority, late majority and the laggards.

Results of the study suggest that individual characteristics including age and gender of the farmer as well as those of the households where regional location matter to group membership. The likelihood to join a farming group increases with education attainment as well as being residence in a household with more cultivable land and better access to services including extension. Education levels in Uganda remain low with the majority of the population having an education below primary level (UBos, 2010), it is therefore important that appropriate recruitment efforts are used during the process of group formation.

For example, although NAADS implementation guideline clearly stipulates a stepwise strategy that allows farmers to be mobilised and educated on the importance of farmers groups, it has been observed that group formation has often been done in a hurry denying would be participants' time to understand and enrol (Friis-Hansen *et al.* 2004).This observation calls for a well organized and planned recruitment that considers the level of education among farmers to ensure more participation. In the short run, government might have to organize 'non-school' education for farmers (for example, through incorporating it in on-going Government programs like NAADS AND NUSAF) because school-based education will take a long time to deliver to (future) farmers.

Additionally, publicity and farmer education on group formation should be given more adequate time and resources with targeting directed towards illiterate farmers and those far away from extension workers. Farmers usually meet in community gatherings like community meetings, churches and usually visit places like hospitals and sub county headquarters. Publicity on the importance of group formation should be at such gatherings and posters having information on group information should be displayed in such places. Other avenues such as radios should also be used for educating farmers on the importance of group formation. Lastly, the teachers

given their respected roles in the community and their access to people through children can be supported to publicize the importance of farmer group membership in efforts to transform agriculture. All the materials used in publicity materials should be translated into the local languages as it is important in ensuring that also the illiterate farmers understand the concept of group formation.

The low participation in farmer groups in Uganda also calls for concerted efforts by all institutions (NAADS, UNFFE, World food programme and UCA, among others) supporting groups to ensure that groups' approach succeeds in improving access to agricultural technologies and ensuring that noticeable outcomes are achieved for them to attract more farmers. Supporting outgrower schemes like that of Ghana could be one such avenue.

Overall this paper has been able to establish and explain the factors that affect participation in farmer groups in Uganda. However due to data limitations, it was unable to explain the weaknesses of the current groups in relation to group formation and membership retention and this could be an area of further research.

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APPENDIX 1: DESCRIPTIVE STATISTICS OF VARIABLES USED IN THE MODEL

Variable	Unit of measurement	No. of Observations	Mean	Standard deviation	Minimum	Maximum
Age	Years	88471	33.99	15.278	16	86
Age squared	Years	88663	1.403	1.325	0.256	8.1
Gender	Male=1 Female =0	92485	0.498	0.500	0	1
Never married	Yes=1, No=0	92485	0.323	0.468	0	1
Married	Yes=1, No=0	92485	0.562	0.496	0	1
Widowed and remarried	Yes=1, No=0	92485	0.062	0.242	0	1
Divorced and not remarried	Yes=1, No=0	92485	0.024	0.154	0	1
Married but separated	Yes=1, No=0	92485	0.028	0.165	0	1
No education	Yes=1, No=0	93760	0.191	0.393	0	1
Some primary	Yes=1, No=0	88592	0.370	0.483	0	1
Completed primary	Yes=1, No=0	88592	0.180	0.384	0	1
Some secondary	Yes=1, No=0	88592	0.218	0.413	0	1
A level or higher	Yes=1, No=0	88592	0.033	0.179	0	1
Share of children above 17 years	Number	92485	0.314	0.217	0	1
Household size	Number	92485	6.630	3.438	1	30
Log of Land	Hectares	92528	0.632	0.448	0	3.40
Local produce market	Kilometres	92528	1.515	0.706	0	6.11
District produce market	Kilometres	92528	2.706	0.803	0	6.63
Local input dealer	Kilometres	92528	1.803	0.793	0	5.74
Extension services	Kilometres	92528	1.972	0.701	0	6.83
Nurseries	Kilometres	92528	2.125	0.836	0	6.69
Feeder roads	Kilometres	92528	0.996	0.601	0	6.22
All year gravel road	Kilometres	92528	1.257	0.711	0	6.40
Crop agriculture	Yes=1, No=0	73332	0.772	0.420	0	1
Non crop agriculture	Yes=1, No=0	73332	0.035	0.183	0	1
Trader/Artisan	Yes=1, No=0	73332	0.034	0.180	0	1
Paid employment	Yes=1, No=0	73332	0.061	0.240	0	1
No activity	Yes=1, No=0	73332	0.031	0.175	0	1

Variable	Unit of measurement	No. of Observations	Mean	Standard deviation	Minimum	Maximum
Housework	Yes=1, No=0	73332	0.067	0.250	0	1
Kampala	Yes=1, No=0	92485	0.006	0.076	0	1
Central 1	Yes=1, No=0	92485	0.079	0.269	0	1
Central 2	Yes=1, No=0	92485	0.083	0.275	0	1
East Central	Yes=1, No=0	92485	0.100	0.300	0	1
Eastern	Yes=1, No=0	92485	0.212	0.408	0	1
Mid North	Yes=1, No=0	92485	0.109	0.312	0	1
North East	Yes=1, No=0	92485	0.042	0.201	0	1
West Nile	Yes=1, No=0	92485	0.084	0.277	0	1
Mid West	Yes=1, No=0	92485	0.121	0.326	0	1
South Western	Yes=1, No=0	92485	0.164	0.371	0	1

APPENDIX 2: HOUSEHOLD MEMBERSHIP TO FARMER GROUPS BY CHARACTERISTICS IN UGANDA

	Proportion %	Average number of HH members in farmer groups
National		
Uganda	16.2	1.6
Household head		
Female head	14.0	1.4
Male head	16.8	1.6
Marital status		
Never married	12.2	1.6
Married	17.9	1.6
Div/Sep/Wid	11.5	1.3
No stated	17.6	1.5
Major activity		
Crop Agric	16.4	1.6
Non-crop agric.	25.3	1.7
Trader/artisan	14.9	1.4
Paid employ	14.9	1.4
No activity	5.9	1.6
HH work	11.3	1.3
Not stated	15.6	1.4
Sub regions		
Central	11.4	1.3
Kampala	11.5	1.4
Central 1	12.9	1.3
Central 2	10.0	1.3
Eastern:	15.1	1.6
East Central	11.8	1.6
Eastern	17.1	1.7
Northern:	21.1	1.8
Mid-North	23.5	1.7
North East	24.4	2.4
West Nile	16.1	1.6
Western:	17.2	1.5
Mid-West	14.7	1.5
South-Western	19.4	1.6

APPENDIX 3: COMPARING LINEAR PROBABILITY, PROBIT AND LOGIT MODEL ESTIMATES

	Models		
	Linear Probability Model	**Probit**	**Logit**
Independent Variables			
Individual characteristics			
Age	0.009***	0.057***	0.111***
Agesq_1000	-0.077***	-0.533***	-1.037***
Farmer is male	-0.006**	-0.052***	-0.099***
Marital status of the farmer (cf: Never married)			
Married	0.033***	0.276***	0.533***
Widowed and not remarried	0.027***	0.243***	0.481***
Divorced and not remarried	0.005	0.111	0.219
Married but separated	-0.020**	-0.098	-0.212
Education level of the farmer (cf: No education)			
Some primary	0.037***	0.211***	0.415***
Completed primary	0.061***	0.347***	0.671***
Some secondary	0.088***	0.491***	0.950***
A level and higher	0.107***	0.601***	1.141***
Main economic activity (cf: crop agriculture)			
Non crop agriculture	0.012	0.061	0.106
Trader/Artisan	-0.033***	-0.181***	-0.342***
Paid employment	-0.038***	-0.247***	-0.487***
No major activity	-0.072***	-0.782***	-1.708***
Home activity	-0.049***	-0.380***	-0.745***
Household characteristics			
Share of Adults> 18 years	0.041***	0.202***	0.380***
Household size	0.001	0.008	0.014
Log of Land size	0.023***	0.128***	0.233***
Infrastructural access			
Logarithm of Distances (km)			
Local produce market	-0.005	-0.027	-0.053
District produce market	0.012***	0.065***	0.127***
Local input shop	-0.004	-0.022	-0.044
Extension worker	-0.013**	-0.065**	-0.126**
Nurseries	0.004	0.013	0.038
Feeder road	0.004	0.032	0.070
All year gravel road	0.025***	0.117***	0.217***
Sub regions (cf: Kampala and Central1)			
Central 2	-0.026**	-0.202***	-0.400***
East Central	-0.029***	-0.182**	-0.350**
Eastern	0.027**	0.161**	0.321**

Mid North	0.082***	0.424***	0.784***
North East	0.153***	0.829***	1.561***
West Nile	0.015	0.095	0.191
Mid West	0.007	0.043	0.094
South Western	0.036***	0.210***	0.403***
No. of observations	68378	68378	68378
R squared/ Pseudo R2	0.0497	0.0784	0.0782
Predicted probability		0.088575	0.085814

Source: Authors calculation based on UCA 2008/09, ***, **, and * indicatestatistical significance at 1, 5 and 10% level; the values reported are coefficients

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