Social capital, shocks and livestock investments: evidence from Masaka District, Uganda

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Abstract

Purpose – The purpose of this paper is to examine the determinants of a household's social capital in the form of community group participation and empirically analyses the roles that social capital plays in helping rural households rebuild productive assets after shocks.

Design/methodology/approach – In this paper, social capital is modelled as a household's intensity of group participation measured by the density and active participation in group activities as well as their multiplicative and additive indices. Instrumental variable methods were used to address the problem of endogeneity associated with social capital.

Findings – The results indicate that household characteristics such as age, education level, dependence ratio and years of village residence as well as village-level characteristics such as the village population density are critical determinants of social capital. In addition, social capital measured in form of density of participation in group activities and attendance score as well as multiplicative and additive indices of these have significant positive effects on the household ability to rebuild livestock assets.

Research limitations/implications – The authors realize that several weakness in the approach could compromise the validity of the findings. These weaknesses include: the cross-sectional nature of the data, the omitted variable bias, the endogeneity concerns of social capital and the identification strategy, sample size and the dimensions the authors chose to measure social capital. Future research should explore the factors that can help households to engage more in-group activities.

Practical implications – The findings have important implications for government policy especially in areas of agricultural development and poverty reduction. Specifically, governments should pay close attention to the various social groups as they can serve as important channels to achieve better social economic outcomes, including the accumulation of rural assets, as is the case with livestock assets in rural Uganda.

Social implications – Many governments in Sub-Saharan Africa are constrained to provide basic public goods to the people. This is due to a combination of limited budgets and lack of good leadership. In such circumstances, the people have to rely on their collective/social effort to take advantage of market opportunities. Such opportunities can be accessed using the existing social structures whose norms and the trust between members permit cooperation.

Originality/value – The study contributes to a small but growing empirical literature on social groups and how they can mediate social economic outcomes especially for rural households.

JEL classification – D, D7, D71, Q120

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The empirical estimations take into consideration the endogeneity concerns associated with social network capital. The paper will be useful for policy makers and researchers who may have a keen interest in the roles that group activities play in agricultural development and poverty reduction.

Keywords Social capital, Uganda, Rural households, Shocks, Livestock assets

Paper type Research paper

I. Introduction

Household participation in some form of group activities is part of the culture of the people in rural Africa. The most common type of traditional groups are the burial associations that provide some kind of insurance after loss of a family member (Dercon *et al.*, 2004, 2005) and informal credit institutions (Kimuyu, 1999). These indigenous informal groups could have emerged as a result of imperfections in the formal insurance markets (Binswanger and Rosenzweig, 1986; Dercon *et al.*, 2005). Such locally initiated informal institutions primarily exist to offer "premium-based" insurance against shocks such as illness or death of a family member (Dercon *et al.*, 2005). Such locally initiated groups normally owe existence to the effort of their members. Support from governments and donors is usually minimal (Dercon *et al.*, 2005).

Non-indigenous formal groups and/or organisations were started primarily as a channel for government and donor support to the local communities usually in response to major covariate shocks. The influx of non-governmental organisations activities in Uganda for example can be traced back to the proliferation of the HIV/AIDS pandemic (Barr *et al.*, 2005). Such organisations have continued to offer humanitarian support to minimise the effects of war, conflict and famine with special attention to women and orphans (Barr *et al.*, 2003). Other groups have been formed to protect the business interests of entrepreneurs (Kuteesa and Mawejje, 2013). Owing to the success of group activities elsewhere, the Government of Uganda has prioritised the formation of farmer groups as conduit for more targeted support to the agricultural sector (Adong *et al.*, 2013).

Literature has traditionally focused on the effects of shocks and the *ex post* coping strategies that households adopt. Such strategies may include reducing consumption (Porter, 2008), engaging in off-farm activities to diversify incomes or look for alternative livelihood sources (Barrett *et al.*, 2001) or even increasing dependence on the natural environment including forests (Vedeld *et al.*, 2007; Debela *et al.*, 2012) some of which may be accessed illegally (Tumusiime *et al.*, 2011). Some households have been shown to run down their productive assets that may typically be livestock (Hoddinott, 2006; Islam and Maitra, 2012), or even rely on social ties embedded in own groups and networks (Debela *et al.*, 2012; Carter and Maluccio, 2003; Skoufias, 2003). It is therefore evident that social capital is important in helping households cope with adverse shocks and that households may run down their livestock asset endowments as a coping strategy. What is not clear is whether social capital helps such households to rebuild their productive assets after idiosyncratic shocks. Only a scanty amount literature examines this. In a study from Ethiopia, for example, Mogues (2006) shows that the evolution of asset endowments is influenced in part by social capital.

It is against this background that this paper investigates the factors that determine household decision to engage in group activities and whether such activities mediate economic outcomes in a rural setting. In particular, we investigate whether social capital helps households to rebuild their stock of livestock assets in the wake of exogenous idiosyncratic shocks.

We model a household's decision to engage in group activities as a binary choice response that depends on own as well as village characteristics. This is achieved by estimating a probit model. The ability of households to rebuild their livestock assets is modelled using an instrumental variable tobit model that takes care of the endogeneity problem associated with social capital. We use a set of instruments that we believe is exogenous and relevant and it includes number of adult household members and duration of membership in organisations. Our first stage regressions (Appendix) support our choice of instruments.

We show that household as well as village characteristics are important determinants of group participation. We also show that our dimensions of social capital approximated by a household's intensity of group participation measured by the density and active participation in group activities as well as their multiplicative and additive indices are very important in helping households to rebuild productive assets.

The remainder of the paper is organised as follows: Section II provides the background to the study area. Section III outlines the theory and methods. Section IV presents the results. Lastly, Section V provides the conclusions.

II. The study area

Our data was collected from 251 households in 2008 in Masaka District, Uganda. Agriculture is the main stay of the population in the district, providing employment to some 75 per cent of the population.

Masaka District enjoys favourable rainfall and has rich loamy soils. For this reason, the district has for long been the food basket for the central region of Uganda. However, climate changes and poor farming methods have resulted into declining soil fertility in the recent years and this has greatly affected the welfare and livelihoods of the people. Opportunities in agriculture have thus dwindled with the effect that many young people have now resorted to selling their land and relocating to urban areas in search of better enterprises with higher returns. Many of them have ended up in motorcycle-taxi business locally known as boda boda.

Many farmers keep cattle and other forms of livestock, which form an important source of animal protein and manure used in the crop fields. Livestock is mainly kept on smallholder mixed farms and by pastoralists in a few areas. Traditionally, livestock assets were not of much commercial importance in central Uganda, where Masaka is located. But the trend is fast changing and most households own some animals. In some ways livestock, especially cattle, is a symbol of wealth and prestige for most households. Livestock assets have traditionally been used in important cultural and social activities including the settlement of bride price for marriage.

Masaka is one of the districts that suffered most from the HIV/AIDS pandemic. Many households lost members with adverse implications for labour supply. To overcome these challenges, many households formed self-help groups through which they would receive support to rebuild their livelihoods. Such support included emotional, psychological as well as support to start up small enterprises for self-sustenance. For similar reasons, many international non-governmental organisations started operations in Masaka to help households cope with various income shocks due to death of important family members and the subsequent labour shortages (Barr *et al.*, 2005). Such organisations include Caritas Maddo, the World Vision and the Lutheran World Federation.

To date, about 250 formal groups and associations exist in Masaka District (MDLGC, 2008). Our field discussions revealed that many households belong to such groups as an *ex post* and sometimes *ex ante* insurance mechanism against shocks. Some households belong to burial, mutual support organisations as well as women organisations. Our data indicate that 72 per cent of all households experienced shocks of which 35 per cent affected livestock assets (Table I).

Our field discussions revealed that while some households join a group as some kind of insurance against some adverse unanticipated occurrence, others join in anticipation of some direct benefits. Such organisations that provide direct benefits include the production and marketing organisations as well as financial and credit service organisations. A more dynamic women's group – *Nigiina* is very vibrant in Masaka District. *Nigiina* is a kind of rotational scheme similar to credit rotating institutions. Members hold weekly meetings and make weekly contributions to a central fund. The money is then used to buy developmental assets (animals, household items, etc) that are given out to members on a rotational basis. Table II summaries the most prevalent types of organisations for the households who reported group memberships in our survey.

III. Theory and methods

This paper assumes that a household i makes a rational decision to join or not join a group based on some expected benefits from group activities (Durlauf and Fafchamps, 2004). Such associational life is very important for building social capital (Grootaert and Narayan, 2004). The literature is rich with possible benefits from associational engagements and they range from increasing households incomes and subsequent poverty reduction (Hassan and Birungi, 2011; Grootaert *et al.*, 2002;

	Number	%
Illness/injury of a family member	115	61
Loss of livestock assets	66	35
Drought	57	30
Death of a family member or relative	38	20
Crop failure/loss due to pests, diseases and theft	23	12
Loss of other assets	10	5
Violent crime or conflict	10	5
Other shocks	6	3
Loss of job	4	2

Table I. Frequency of household shocks in Masaka District

Organisation type	Number	%
Financial and credit service organisations	38	27.2
Women's support organisations	36	25.7
Burial and other mutual support organisations	29	20.7
Non-governmental organisations	14	10
Production and marketing organisations	15	10.7
Other groups	8	5.7
Total	140	100

Table II. Types of organisations

Narayan and Pritchett, 1999), adoption of sustainable agricultural practices (Munasib and Jordan, 2011), facilitation of better market outcomes (Fafchamps and Minten, 2001) and enterprise performance (Barr, 1998), ensuring food security (Sseguya, 2009), and reducing malnutrition among young children (Carter and Maluccio, 2003).

A household's decision, y_i to join a group may depend on own characteristics x_i as well as village characteristics z_i. Such a decision can be modelled as a binary outcome that takes the value 0 or 1 such that:

$y_i = 1$ if household i belongs to at least one group.

$y_i = 0$ otherwise.

The relationship between y_i, x_i and z_i can be expressed as a linear model given by:

$$y_i = \beta_0 + \beta_1 x_i + \beta_2 z_i + \varepsilon_i \tag{1}$$

where x_i is a vector of household characteristics that may include: the age of the household head, gender, education level, duration of village residence, household size and dependence ratio and a dummy variable that captures previous exposure to shock(s). The vector z_i includes distances to the market and major roads, village population density as well as locational dummy variables that capture village remoteness and other fixed effects. The above relationship was estimated using a probit model to derive the marginal effects of the important factors that influence household participation in group activities.

After determining the factors that influence a household's decision to engage in group activities, we investigated whether such group interactions help households to rebuild their livestock assets. We assume that livestock management and other farm activities are influenced by the household's ability to supply own labour. Labour will be supplied to the activities with higher marginal returns. In this study, we use total household labour supply, which is the total number of mature household members between the ages of 15 and 65. The observed change in household livestock asset value, ΔL is the difference between the end of period and beginning of period asset values. The value of livestock rebuilt is positively influenced by the natural growth rate, $g(L_0)$ the net value purchased ΔL^P, net livestock received as gift (ΔL^G), and negatively affected by those lost due to shocks for example through death and theft (ΔL^{shock}), sold (ΔL^S), and those slaughtered for own consumption (ΔL^C):

$$\Delta L^R = g(L_0) + (\Delta L^P - \Delta L^S) + \Delta L^G - \Delta L^{shock} - \Delta L^C \tag{2}$$

We try as much as possible to model livestock asset rebuilding based on exogenous variables, so our empirical model does not include potentially endogenous factors such as value of credit income, land, off-farm wage, education, and extension services. We assume that the optimum value of assets that a household can rebuild depends on the level of social capital (SC), initial livestock value (L_0), livestock shock losses (ΔL^{shock}), the ability to supply own labour (T), exogenous income from remittances ($increm$), exogenous household characteristics (Z^h), and village level characteristics (V^h). The empirical model is expressed in its general form as:

$$\Delta L^R = f(SC, L_0, \Delta L^{shock}, increm, T, Z^h, V) \tag{3}$$

We propose that the effects of social capital on livestock production is fourfold:

(1) Social capital acts as insurance against the effects of shocks that could diminish a household's stock of livestock assets.
(2) Social capital helps people to obtain information about livestock investment opportunities and possibilities.
(3) Some groups do give out livestock in the form of rotating livestock credit schemes.
(4) Repeated interaction with group members builds trust which influences households' decisions to enter into livestock share contracts.

These contracts provide important channels through which the livestock poor households acquire these assets. This paper thus tests the hypothesis that better connected households are more able to rebuild and grow their productive assets than the less connected ones.

We develop four measures of social capital based on two dimensions: group density and active participation. Density of group membership is the number of organisations that a single household subscribes to. The attendance score is a measure of active participation and is computed as a percentage for attending mandatory group meetings. These measures are then aggregated multiplicatively and additively to generate two indices for each household. The indices are later rescaled to lie between 0 and 100. These indices are similar to the ones developed by other scholars in social capital, most notably by Narayan and Pritchett (1999) and Grootaert *et al.* (2002).

The endogeneity of social capital

A vast amount of literature has emphasized the fact that social network capital is endogenous (Hassan and Birungi, 2011; Durlauf and Fafchamps, 2004; Dasgupta, 2003; Narayan and Pritchett, 1999). Moreover, participation in associations is costly in terms of time and lost income in terms of foregone work. Association members are also sometimes required to make regular contributions in form of subscription fees which may be payable in cash or in kind. In addition, it could turn out that the causality between our variable of interest and social capital is a two-way relationship: those households that have higher livestock assets may be more able to join associations because they can afford to pay subscription fees and meet other commitments.

Intuitively, it could also be true that there are some unobservable individual characteristics that are correlated with social capital. For example, some individuals may possess intrinsic characteristics that make them more sociable and therefore are more likely to engage in associational life. Family background, mental ability, intrinsic leadership abilities and character are some examples of unobservable characteristics.

Another challenge with social network capital is that of self selection. Basically individuals are free to choose whether to join an association or not. Those who choose to join may have similar characteristics and interests and their decisions to participate in network activities are not likely to be random. If the decisions to join a group are correlated with other explanatory variables or even our dependent variables, then we can no longer argue that the explanatory variables are not correlated with the error term. In this case a simple regression of a household outcome on any measure of social capital may yield biased and inconsistent estimates due to the endogeneity of group participation.

To overcome this endogeneity problem, we rely on an identification strategy that uses the number of adult household members and duration of membership in

organisations as instruments for our social capital constructs. The validity of relying on this instrumental variable approach to establish a causal relationship between social capital and a household's ability to rebuild livestock assets must satisfy two important conditions: The first is that our instruments, the number of adult household members and the length of group membership, should be correlated with social capital. We show this in the first stage regressions. The second condition is that the instruments should affect a households' ability to rebuild livestock assets only through their effect on social capital. While it is difficult testing the second condition, we provide some evidence that suggests that it holds. To achieve this, we carry out various tests that confirm our instrument validity and exogeneity as shown in Table V.

The model

Therefore, to evaluate the effects of group participation on the ability of households to rebuild their livestock assets we estimate the following system of equations:

$$\Delta L_i^R = \beta_0 + \beta_1 SC_i + \beta_2 L_{0i}^2 + \beta_3 \Delta L_i^{shock} + \beta_4 increm_i + \beta_5 T_i + \beta_6 Z_i^h + \beta_7 V_i^h + \varepsilon_i \quad (4)$$

$$SC_i = \beta_2 L_{0i}^2 + \beta_3 \Delta L_i^{shock} + \beta_4 increm_i + \beta_5 T_i + \beta_6 Z_i^h + \beta_7 V_i^h + \varepsilon_i \quad (5)$$

Equation (4) is the outcome function of interest and is estimated as a Tobit model. Equation (5) is the first stage regression in which our measures of social capital are regressed on the instruments as well as all the other covariates in the outcome equation. In estimating this system of equations, we use Newey's (1987) two-step minimum χ^2 estimator as applied to the Tobit model.

The initial livestock asset value is included in squared form as it is expected to be nonlinearly related with build-up of livestock, assuming that given other assets, there is an optimal livestock asset level for the household. A convex relationship may indicate that there are capital constraints and learning effects (non-convexities) related to livestock accumulation, while a concave relationship may indicate diminishing returns to livestock asset accumulation.

Our choice of the Tobit model is guided by the work of Sigelman and Zeng (1999, p. 167) who, building on the seminal work of Tobin (1958), argued that "the standard Tobit model is applicable only if the underlying dependent variable contains negative values that have been censored to zero in the empirical realisation of the variable". Indeed our dependent variable, the value of livestock assets rebuilt for each household, has some negative, zero and positive variables as has been shown earlier. We have censored all the negative variables to zero.

In our sample, only 90 households are members in at least one organisation. The mean number of organisations per household is just above 0.5 for the whole sample and 1.5 for the households that have reported membership. Of the 251 households sampled, a total of 154 households have gained value in terms of rebuilding their livestock assets, 31 households have reported losses in value of livestock assets, while 66 have neither gained nor lost, including those households which never owned any livestock assets at all. Figure 1 shows the distribution of households by change in livestock holding.

The mean livestock value gained for the households that have seen their livestock value grow is 237,739 Uganda shillings with a minimum of 4,800 Uganda shillings and a maximum of 2,900,000 Uganda shillings. The mean livestock value lost for households that have experienced losses is 251,383 Uganda shillings with minimum

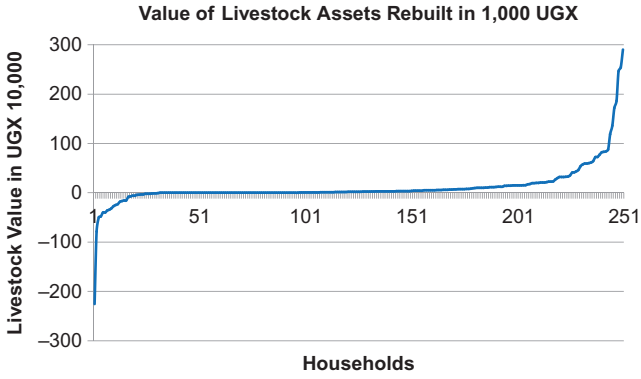

Figure 1.
Distribution of the value of livestock assets rebuilt in Masaka

losses of 6,000 and maximum losses of up to 2,251,457 Uganda shillings. These descriptive statistics show that on the average, more households have been able to grow their livestock assets.

The distribution of livestock assets is such that those households that have high initial livestock values are more likely to have a high end of period livestock value. The high increase for these household is mostly likely through the natural growth rate as well as the fact that such households may have more experience in livestock production and may have physical structures already in place which makes additional costs for expanding the livestock base low. It can also be observed that the households that have experienced the highest value of shock losses as well have the highest initial livestock and end value stocks. The cases where the shock loss is larger than the initial livestock value may indicate that some households lost livestock that were bought or gained during the same time interval, but were not part of the initial value. Figure 2 shows the distribution of livestock wealth shocks by households in Masaka contrasted with the initial and end of period livestock stocks.

IV. Results and discussion

Factors that determine group participation

Table I presents the marginal effects of the probit model estimates for the factors that determine group participation. Our results indicate that both household as well as

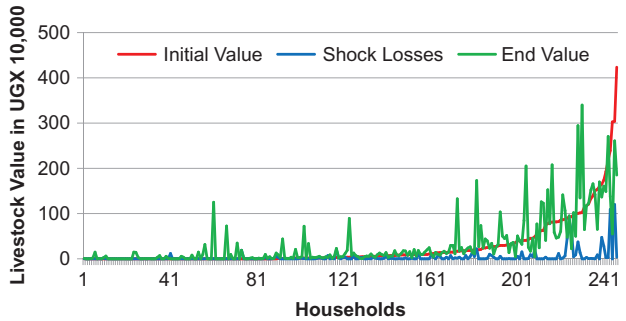

Figure 2.
Distribution of value of livestock assets and shocks by household in Masaka

village level characteristics are critical determinants of social capital. For example, older households are more likely to join groups, but this effect diminishes after a certain critical age as this is evidenced by a negative and statistically significant coefficient on the square of the age of a household head. Other important household characteristics are: gender of the household head (male-headed households are more likely to join a group); the education level of a household head; the duration of village residence, and dependency ratio. Previous exposure to shocks does not seem to influence a household's decision to join a group (Table III).

Village characteristics particularly village population density as well as locational fixed effects, captured by sub county dummy variables density, explain the participation in group activities.

Social capital and livestock investments

We use instrumental variable Tobit models to estimate the impact of social capital on the value of livestock assets rebuilt by a household. We develop four models:

(1) Model A is estimated with group density as a regressor.

(2) Model B is estimated with the attendance score as a regressor.

	Dependent variable: group participation		
	Marginal effect	SE	*p*-value
Household characteristics			
Age of household head	0.047**	0.023	0.041
Square of age of household head	−0.001**	0.000	0.019
Household head is male	0.099	0.104	0.372
Years of schooling	0.023*	0.013	0.079
Dependency ratio	0.583**	0.239	0.018
Past exposure to shocks (yes = 1)	−0.047	0.102	0.639
Log of household members age > 15	0.176	0.122	0.149
Log of years of village residence	0.176***	0.064	0.007
Village characteristics			
Log of distance to seasonal road in km	−0.214	0.181	0.235
Log of distance to paved road in km	−0.064	0.091	0.482
Village population density	0.001**	0.000	0.028
Locational fixed effects			
Bukulula Subcounty (yes = 1)	−0.237*	0.092	0.095
Butenga Subcounty (yes = 1)	−0.257**	0.081	0.037
Kabonera Subcounty (yes = 1)	−0.219*	0.090	0.051
Kyanamukaaka Subcounty (yes = 1)	−0.136	0.207	0.493
Kingo Subcounty (yes = 1)	0.311*	0.185	0.090
Kyazanga Subcounty (yes = 1)	0.334	0.210	0.115
Lwengo Subcounty (yes = 1)	0.348**	0.168	0.041
Number of observations	169		
LR χ^2 (18)	64.68		
Prob. > χ^2	0.000		
Pseudo R^2	0.290		

Note: Significant at: *10, **5 and ***1 per cent levels

Table III.
Probit estimates of the factors that determine group participation

(3) Model C is estimated with a multiplicative social capital index of density and attendance score as a regressor.

(4) Model D is estimated with an additive social capital index of density and attendance score as a regressor.

The first stage regressions support our choice of instruments for all the three models (See the Appendix for the first stage regressions). Table IV shows the econometric results from the instrumental variable Tobit regression models using value of livestock rebuilt as a dependent variable.

All the four models exhibit consistency in the expected signs of the coefficients and significant social capital coefficients. This underlines the importance of social capital for households to rebuild their productive assets.

All the models exhibit highly significant coefficients for the square of initial livestock value, highlighting that the fact that those households which originally own livestock assets are likely to accumulate more. This may also indicate that there are increasing marginal returns to livestock. This could be a sign of a possible asset poverty trap and non-convexities causing increasing returns.

	Dependent variable: value of livestock rebuilt			
	Model A	Model B	Model C	Model D
Group density	252,970***			
	(3.11)			
Meeting attendance		6,805***		
		(3.08)		
Multiplicative index			13,058***	
			(3.05)	
Additive index				6,733***
				(3.09)
Square of initial livestock value	0.053***	0.054***	0.053***	0.053***
	(4.97)	(5.17)	(5.05)	(5.17)
Livestock value lost to shocks	−0.091	−0.067	−0.015	−0.064
	(−0.40)	(0.31)	(−0.07)	(−0.30)
Exogenous income (remittances)	0.111	0.065	0.082	0.066
	(1.38)	(0.83)	(1.02)	(0.84)
Household head is male (yes = 1)	159,678*	155,897*	140,845	155,925*
	(1.81)	(1.79)	(1.57)	(1.79)
Distance to nearest market (km)	−3,495	−160	−322	−213
	(−0.28)	(−0.01)	(−0.03)	(−0.02)
Distance to seasonal road (km)	−22,250	−23,797	−32,882	−23,764
	(−0.65)	(−0.71)	(−0.96)	(−0.71)
Duration of village residence	925	3,540	2,293	3,492
	(0.25)	(1.04)	(0.64)	(1.03)
Age of household head	1,785	450	632	473
	(0.56)	(0.14)	(0.19)	(0.15)
Constant	−374,820***	−333,977**	−306,725**	−334,659**
	(−2.68)	(−2.43)	(−2.018)	(−2.44)
Number of observations	229	229	229	229
Wald χ^2	61.18***	62.39***	61.03***	62.50***

Notes: Significant at: *10, **5 and ***1 per cent levels; the coefficients are tabulated; *Z*-statistics are in parentheses; standard errors are corrected for predicted values

Table IV.
Livestock investment models

From the results, we discover that male-headed households are in a better position to rebuild their assets than female-headed households. The coefficients of sex of the household head are positive and significant (at 10 per cent level only) in three of the models. Livestock production is a very labour intensive activity requiring manual strength for proper management. In Masaka, gender roles are predetermined and enforced by the conservative culture of the native Ganda tribe. Women are generally seen as weak and delicate and discouraged from potentially strenuous activities leaving them to tend to crops and housework. Male-headed households and households with more male labour are more likely to build their livestock assets.

Models C and D use the aggregated multiplicative and additive social capital indices, respectively, as regressors. Aggregating the variables into a single index gives us some important insights about the role of social capital in facilitating livestock investments. We assume that it makes more sense not to be just a member in an organisation, but to be an active member. The main findings are robust across the different models and this strengthens confidence in the conclusions.

Diagnostic and model validity tests

We carry out the Wald tests of exogeneity, which are basically tests of whether our social capital constructs are truly endogenous. For all the models under consideration, we reject the null hypothesis that the correlation parameter is not significantly different from zero, indicating that our social capital variables are truly endogenous and that our instrumental variable approach is justified.

Based on the first stage regressions, we carry out tests for the joint significance of the instruments, which is basically a test for the relevance of the instrumental variables used in our models. In accordance with the literature (Kilic *et al.*, 2007; Staiger and Stock, 1997) the rule of thumb is that the joint *F*-statistics should be at least equal to 10. For all our models the joint *F*-statistics are high and significant implying that our instruments are relevant.

To further test the validity of our instruments and models, we used the Amemiya-Lee-Newey minimum χ^2 test for over identifying restrictions which are basically joint tests for model specification and validity of instruments based on Baum *et al.* (2006). The null hypothesis is that the used group of instruments is exogenous and relevant: that is, they are not correlated with the error term but are correlated with social capital. We do not find sufficient information and evidence in our data to reject the null hypothesis presented above. Our models therefore pass the tests which confirm the validity of our models and choice of instruments. Table V summarises the three test results for each of the estimated models.

	Model A	Model B	Model C	Model D
Wald test of exogeneity	11.61 (0.001)	11.88 (0.001)	12.92 (0.000)	11.89 (0.001)
Amemiya-Lee-Newey minimum χ^2 statistic	0.037 (0.848)	0.594 (0.441)	0.309 (0.578)	0.579 (0.447)
First stage *F*-statistic (test of joint significance of instruments)	29.21 (0.000)	36.03 (0.000)	36.59 (0.000)	28.27 (0.000)

Note: Tabulated are the χ^2/*F*-test values, *p*-values are in parentheses

Table V.
Summary of diagnostic and model validity test results

V. Conclusions

Using household level data from 251 households and 19 villages, this paper investigated the determinants of social capital and the role it plays in helping rural households rebuild livestock assets. We assume that the major pathway through which the effects of social capital are transmitted is the access and subsequent transfer and sharing of information about markets and other opportunities.

We have used group memberships as proxies for social capital. Specifically, we measured social capital using density of memberships and by computing the attendance percentage score for each household as a measure of active participation in group activities. We then aggregated these dimensions into multiplicative and additive social capital indices.

In order to address the endogeneity problem that is associated with social capital, we have used instrumental variable methods of parameter estimation. Specifically, we have used the two stage least squares method for the price models and the instrumental variable Tobit models for the livestock models. We have instrumented for social capital using a set of variables that includes number of adult household members and duration of membership in organisations.

We are able to show that village as well as own characteristics influence a household's decision to join a group. We further show that higher levels of group participation are associated with an increased ability for households to rebuild their productive assets. We have also found signs of a productive asset trap in the study area. However, we have not investigated how this may be related to the poverty of households more generally and their consumption levels. This is left for follow-up research. Our findings have important policy implications for the development of effective local level risk management institutions.

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(The Appendix follows overleaf.)

Appendix

Table AI.
First stage regressions

	Dependent variable			
	Density	Attendance	Add. Index	Mult. Index
Duration of group membership	0.087 (0.014)***	3.542 (0.467)***	3.577 (0.468)***	1.808 (0.279)***
Number of adult members	0.099 (0.032)***	1.983 (1.052)*	2.036 (1.055)*	1.351 (0.628)**
Square of initial livestock value	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Household head is male (yes = 1)	0.072 (0.138)	0.739 (4.462)	0.781 (4.479)	0.501 (2.666)
Livestock value lost to shocks	0.000 (0.000)*	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Exogenous income (remittances)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Distance to seasonal road	−0.017 (0.051)	−0.351 (1.665)	−0.360 (1.671)	−0.549 (0.995)
Distance to nearest market	−0.020 (0.018)	−1.218 (0.597)*	−1.223 (0.599)**	−0.627 (0.657)*
Age of household head	0.004 (0.005)	0.087 (0.166)	0.084 (0.166)	0.022 (0.099)
Length of village residence	0.005 (0.006)	0.108 (0.187)	0.104 (0.188)	0.026 (0.112)
Constant	0.304 (0.214)	5.610 (6.943)	5.774 (6.968)	0.855 (4.148)
Number of observations	229	229	229	229
R^2	0.311	0.309	0.313	0.289
F-statistic (first stage instrument)	29.21***	36.03***	36.59***	28.27***

Note: Significant at: *10, **5 and ***1 per cent levels