Matching in Community-Based Organizations*

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Abstract

Using a rich dataset from West Africa, we examine the household characteristics associated with membership in community-based organizations (CBOs). We find that on average it is the more fortunate members of rural society who belong in CBOs. In Senegal, the dominant criterion is land ownership. In Burkina Faso it is age and family ties with village authorities. Ethnicity plays a role as well: CBO membership is less likely for ethnic groups that traditionally emphasize livestock raising. Next we look for evidence of assortative matching along multiple dimensions, using an original methodology based on dyadic regressions. We find robust evidence of positive assorting by physical and ethnic proximity as well as by wealth and household size. Along certain dimensions, donor-sponsored CBOs are less elitist and more inclusive. But the reverse is true for other dimensions, particularly in Burkina Faso.

Keywords: assortative matching, group membership, dyadic regressions, international development agencies

JEL classification: D71, D31, 012

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1 Introduction

Recent years have witnessed a renewed policy interest in community-based development (Mansuri and Rao 2004). This interest is predicated on the premise that interventions at the level of a local community can deliver more effective and equitable development.

In practice, such interventions are often channeled through community-based organizations (CBOs), especially in rural areas. Whether effective and equitable development can be achieved by assisting CBOs ultimately depends on their composition. If CBOs are composed primarily of local elites, interventions channelled through them are likely to reflect the preferences and interests of these elites.[1] Similarly, if CBOs form along gender or ethnic lines, their mode of operation is likely to reflect the interests of specific gender or ethnic groups. Knowing CBOs' composition is thus of interest to policy makers. Yet surprisingly little rigorous analysis has been devoted to this topic.[2]

This paper provides elements of answer using two large household surveys in Senegal and Burkina Faso, West Africa. There is a high prevalence of CBOs in both countries, with most villages having at least one and many villages having several. We examine the household characteristics associated with CBO memberships. Since our analysis is based on cross-section survey data, it is perilous to interpret our findings in a causal manner. To do so, we have to rule out the possibility that characteristics of CBO members are a consequence of membership. For this reason we focus on household characteristics that are reasonably time-invariant, such as the year of birth, ethnicity, gender, and schooling of the household head, and blood ties with village authorities. Owned land is included as well because, in the context of the two study areas, land usufruct rights are obtained primarily through bequests. Liquid wealth and current economic status are excluded.

It is conceivable that assortative matching is driven by the type of activity undertaken by the CBO. For instance, if CBOs were set up primarily to assist agricultural production and marketing, we expect land ownership to be associated with CBO membership. We investigate this possibility at the end of the paper. However, in the study area, CBOs engage

[1] A issue related to elite capture (Platteau and Gaspart 2003).

[2] There is a growing literature on factors influencing decision-making at the local level (e.g. Bardhan and Mookherjee 2006b, Bardhan and Mookherjee 2006a, Bardhan and Mookherjee 2005, Besley, Pande, Rahman, and Rao 2004, Besley and Coate 2003). But this literature focuses primarily on formal local institutions, for instance in Asia. No such analysis appears to have been conducted in Africa.

in a wide and evolving range of multiple activities, including finance, vocational training, crafts, farming, mutual insurance, and public good provision. CBO activity is ultimately a choice of its members: CBOs are not, by design, restricted to households with a specific interest.

The empirical analysis is divided into two steps. We first investigate characteristics associated with a higher likelihood of belonging to a CBO. This part of the analysis follows a standard regression approach in which the household is the unit of analysis. We find that large households with a lot of land, a young head, and more ties with village authorities are more likely to belong to a CBO. Ethnicity also appears to play an important role: CBO membership is less likely for ethnic groups that traditionally emphasize livestock raising. We also examine whether male and female membership in CBOs are associated with different household features. We only find minor differences.

We then examine the data for evidence that CBO members share similar characteristics. Empirical work on assortative matching has been hindered by the fact that assortative criteria are often correlated. This makes inference difficult. To see why, suppose that CBO members have similar wealth and ethnicity. If ethnicity and wealth are correlated, univariate correlation analysis does not enable the researcher to decide whether members of the same association share the same ethnicity because they sort on wealth, or whether they share the same wealth because they sort on ethnicity. What we need is a way to conduct multivariate analysis on assortative matching. To this effect, we develop an original methodology that relies on dyadic regressions.[3] We construct the set of all possible pairs of households in each of the surveyed villages and investigate whether two households are more likely to belong to the same association if they resemble each other along various dimensions. Village fixed effects are included as controls.

We find strong evidence of positive assortative matching. Social and geographical proximity matter: households are more likely to belong to associations with nearby households that come from the same ethnic group. Large households tend to be found in organizations with large households – and vice versa. Similarly, female-headed households are more likely to belong to organizations that include other female-headed households.

[3] An estimating equation is said to be dyadic if each observation corresponds to a *pair* of individuals. Dyadic regressions are increasingly being used by sociologists and economists to study network formation (e.g. Snijders and Borgatti 1999, Sacerdote 2000, Fafchamps and Gubert 2006).

There is some evidence of sorting by economic status: land-rich and well-connected households are found in organizations with other land-rich and well-connected households – and vice versa. The relevant dimensions of economic status vary somewhat between the two countries. In Senegal, households who join the same CBO tend to have similar land endowments and education. In contrast, Burkinabe households are sorted into different CBOs on the basis of age and ties with village authorities: elders with close ties to the village chief are found in organizations with others like them, while younger, less well-connected households are found in other CBOs.

These results suggest that CBOs may be elitist – especially so in Burkina Faso. We therefore suspect that they may play a role in the reproduction of economic stratification. If external actors wish to achieve their stated goal of social justice, they must pay attention to the social and economic composition of the CBOs they assist. We have seen that membership in CBOs is less likely for households that have less land and connections, are headed by women, are located at the village periphery, and have an ethnicity different from the rest of the village. Channeling development assistance through CBOs may thus fail to reach certain segments of society, unless targeting is put in place.

To investigate whether development assistance through CBOs successfully targets excluded groups, we test whether donor-sponsored CBOs display less assortative matching by wealth and social ties than CBOs that receive no direct support from NGOs and international agencies. We find that, in these two countries at least, donors have not managed to make the CBOs they sponsor fully inclusive. However, there is evidence that, along some dimensions, donor-sponsored CBOs are more inclusive. This more true in Senegal than in Burkina Faso where, in some dimensions, donor-sponsored CBOs appear more elitist, not less. This does not mean that donors seek to favor village elites – only that donor involvement does not eliminate the tendency to elitism that pervades the CBO sector in these two countries, and especially in Burkina Faso.

It is not possible to assess why donor-sponsored CBOs fail to be more inclusive on the basis of our data alone. It is possible that donors seek to be more inclusive but the lure of external finance attracts influential members of the community to the CBO. We investigate one possible such mechanism, namely, that donors focus on agricultural production and that as a result the CBOs they fund naturally attract better landed households. We find instead that it is government sponsored CBOs that focus on agriculture; donor-sponsored CBOs in contrast are involved in a wide range of economic and social activities. Controlling for an agricultural focus does not change our results regarding the association between elitism and donor-sponsorship. Although the analysis presented here cannot identify the direction of causality, it is sufficiently disturbing to justify further enquiry into the issue.

The remainder of the paper is organized as follows. In Section 2 we present a stylized model of CBO formation. Depending on complementarities in the production of the CBO club goods, equilibrium configurations can be elitist or inclusive, and involve positive or negative assorting. The testing strategy is presented in Section 3. The data are introduced in Section 4, together with a description of the general characteristics of the studied households. In Section 5 we consider the determinants of CBO membership at the household level. Dyadic regression results are discussed in Section 6. In Section 7 we investigate whether donor-sponsored CBOs are more inclusive and less elitist. Section 8 concludes.

2 A model of endogenous CBO formation

To motivate the empirical analysis, we begin with a simple model of endogenous CBO formation. The purpose of this model is to illustrate the issues surrounding CBO membership and to obtain useful insights for empirical analysis. We show that, under fairly generic conditions, equilibrium group membership can vary dramatically. In some equilibrium configurations, only rich villagers join the group while in others membership is limited to the poor. There also exist equilibrium configurations in which only middle income households join, and others in which only middle income households do not join. Next we present our testing strategy and explain how dyadic analysis can deal with questions that a more standard analysis cannot address. Finally, we discuss how funding by an external donor may affect group membership.

2.1 Preliminaries

Let preferences be a function of private consumption c and of the club good provided by the CBO, denoted by g. We write:

$$u(c, g) = u\left(y - t, t\right) \tag{1}$$

where t represents a membership fee. Variable y denotes any aggregate that raises utility and affects the marginal utility of the club good. In what follows, y is taken to be income or wealth, but this is not essential.[4] Variable y is assumed to be distributed over the interval $[\underline{y}, \overline{y}]$ according to the *pdf* $f(y)$, with associated *cdf* $F(y)$.

We assume that u is increasing and concave in both its arguments ($u_c > 0, u_g > 0, u_{cc} < 0, u_{gg} < 0$). The sign and magnitude of the cross partial derivative u_{cg} plays an important role in the analysis. To illustrate this, consider the following two examples. *Example 1:* Let y be agricultural output and g be an agricultural service. Utility is increasing in agricultural output. The marginal utility gain from the agricultural service is likely to increase with the household's reliance on agriculture as a source of income. This implies that $\frac{\partial^2 u(c,g)}{\partial y \partial g} = u_{cg} > 0$. Intuitively, people occupied in agriculture have an incentive to form a group that provides an agricultural service. *Example 2:* Let y be precautionary savings and let g be mutual insurance. Utility increases with the level of precautionary savings. The marginal utility of mutual insurance falls with more personal precautionary savings: $\frac{\partial^2 u(c,g)}{\partial y \partial g} = u_{cg} < 0$. In this case, those with less precautionary saving have more incentive to join the group. Formalizing this intuition is the focus of this section.

Before doing so, we note that the main simplifying assumption behind equation (1) is that there is no return to group size in the provision of the public good: the cost of membership t is the same as the individual benefit. This implies that the sole function of the group is to make the provision of public good t possible. In other words, villagers cannot secure t without joining a group. This simplifying assumption enables us to derive simple comparative statics that provide useful insights regarding the determinants of group membership. Allowing for group size to affect preferences in equation (1)[5] leads to a more cumbersome model but, as we argue in section 3.1, it would not affect the theoretical underpinnings of our testing strategy.

Consider a prospective CBO member with income $\widehat{y}$. The optimal choice of t by $\widehat{y}$ is defined by the first-order condition (FOC):

$$\frac{\partial u(\widehat{y} - t, t)}{\partial t} = -u_c(\widehat{y} - t, t) + u_g(\widehat{y} - t, t) = 0, \tag{2}$$

[4] For instance, if contribution t takes the form of labor, then y is the time endowment of the household.

[5] For example, by positing $u(c, g) = u(y - t, tN, N)$ where N is group size.

The second-order condition (SOC), which we assume to be satisfied,[6] is given by $u_{cc} - 2u_{cg} + u_{gg} < 0$. The Implicit Function Theorem implies that:

$$\frac{dt}{d\widehat{y}} = \frac{u_{cc} - u_{gc}}{u_{cc} - 2u_{cg} + u_{gg}}. \tag{3}$$

The denominator of (3) is the SOC. If the numerator is positive, membership dues are decreasing in $\widehat{y}$, and vice versa. Whether $\frac{dt}{d\widehat{y}} \lesseqgtr 0$ thus ultimately depends on the sign of u_{gc} and on its magnitude relative to u_{cc}, which is always negative.

If t is chosen by individual $\widehat{y}$, so that $t = t(\widehat{y})$, a villager with income y joins the CBO whenever the gain from joining $\Phi(\widehat{y}, y)$ is positive, i.e., if:[7]

$$\Phi(\widehat{y}, y) \equiv u\left(y - t(\widehat{y}), t(\widehat{y})\right) - u\left(y, 0\right) \geqslant 0. \tag{4}$$

Below, we will appeal to the Median Voter Theorem to set $\widehat{y}$. The limit type (or types) $\widetilde{y}$ of those who wish to join the group is (are) implicitly defined by:

$$\Phi(\widehat{y}, \widetilde{y}) = u\left(\widetilde{y} - t(\widehat{y}), t(\widehat{y})\right) - u\left(\widetilde{y}, 0\right) = 0. \tag{5}$$

We restrict our attention to situations in which at most **two** values of $\widetilde{y}$ satisfy equation (5). More complicated configurations are possible but are left for future work.[8]

How membership in the CBO is distributed along interval $[\underline{y}, \overline{y}]$ is ultimately determined by equation (5). To analyze it, consider the derivative of the gain from joining the group

[6] When c and g are complementary ($u_{cg} < 0$), the SOC is not necessarily negative. In this case, satisfying the SOC requires that u be sufficiently concave in c and/or g, which we assume.

[7] We assume here that villagers can join only one group. This assumption can be relaxed as long as each groups provides a club goods that does not affect the marginal benefit of club goods provided by other groups. Tackling explicit competition for members amongst groups is left for future reseearch.

[8] By a first-order Taylor expansion, equation (5) can be rewritten as $\Phi(\widehat{y}, \widetilde{y}) \approx t(\widehat{y})\left[u_g\left(\widetilde{y}, 0\right) - u_c\left(\widetilde{y}, 0\right)\right] = 0$. Taking this to be a partial differential equation, and setting $u_g\left(c, g\right) - u_c\left(c, g\right) = \alpha + \beta c + \gamma c^2$ (with β and γ of opposite signs) so as to obtain two solutions in c yields: $u\left(c, g\right) = \frac{1}{6}\left(-6\alpha c - 3\beta c^2 - 2\gamma c^3 + 6\Psi(c + g)\right)$, where $\Psi(.)$ is an arbitrary function. If one picks the specific solution in which $\Psi(.)$ is the identity function, it is easy to verify that the counterpart to equation (5) is a quadratic $\left(\frac{1}{6}t\left(6\alpha + 2\gamma t^2 + 6\widetilde{y}(\beta + \gamma\widetilde{y}) - 3t(\beta + \gamma\widetilde{y})\right)\right)$ which yields two solutions in $\widetilde{y}$. The SOC is satisfied in this case as long as $-\beta + 2\gamma(t - \widehat{y}) < 0$, which holds for one of the two roots of the FOC, under the technical condition that $-\sqrt{\beta^2 - 4\alpha\gamma} < 0$. This example shows that the case in which equation (5) has two roots is not pathological and corresponds to a well-behaved model.

with respect to income:

$$\Phi_y(\widehat{y}, y) = \frac{\partial}{\partial y}\left[u\left(y - t(\widehat{y}), t(\widehat{y})\right) - u\left(y, 0\right)\right] = u_c\left(y - t(\widehat{y}), t(\widehat{y})\right) - u_c\left(y, 0\right)$$

A first-order Taylor expansion yields:

$$u_c\left(y - t(\widehat{y}), t(\widehat{y})\right) \approx u_c\left(y, 0\right) - t(\widehat{y})u_{cc}\left(y, 0\right) + t(\widehat{y})u_{cg}\left(y, 0\right).$$

It follows that:

$$\Phi_y(\widehat{y}, y) = u_c\left(y - t(\widehat{y}), t(\widehat{y})\right) - u_c\left(y, 0\right) \approx t(\widehat{y})\left[u_{cg}\left(y, 0\right) - u_{cc}\left(y, 0\right)\right]. \quad (6)$$

The expression in square brackets on the right-hand-side of (6) corresponds to *minus* the numerator of the comparative statics result given in (3). This is a second indication of how $u_{cc} - u_{gc}$ determines group formation. We consider four cases which correspond to different behavior of the quantity $u_{cg} - u_{cc}$ over the support of y.

Given the assumption that (5) has at most two roots, for a given t there are four possible equilibrium configurations implied by participation condition (4):

- **Configuration 1:** $u_{cg} - u_{cc} > 0$. High y type individuals join the group. When $u_{cg} - u_{cc} > 0$, by (6) $\Phi_y > 0$. This implies that individuals with $y \geqslant \widetilde{y}$ chose to join, and the upper bound on group membership is given by $\overline{y}$. In this configuration, the size of the CBO is given by $1 - F(\widetilde{y})$.

- **Configuration 2:** $u_{cg} - u_{cc} < 0$. Low y type individuals join the group. Since $\Phi_y < 0$, if there is a single $\widetilde{y}$, individuals with $y \leqslant \widetilde{y}$ chose to join, and the lower bound on group membership is $\underline{y}$. The size of the group is $F(\widetilde{y})$.

- **Configuration 3:** $u_{cg} - u_{cc}$ is *inverse* U-shaped in y. The **middle** of the distribution of y joins the group. Suppose that $\Phi_y > 0$ for relatively low values of y and that $\Phi_y < 0$ for relatively high values of y. This implies that participation condition (5) takes on an inverted-U shape. It also implies, by (6), that $u_{cg} - u_{cc}$ changes sign as one moves from the lower to the upper bound of the distribution of y. Hence there are two values of $\widetilde{y}$ that satisfy (5). Denote these two values by $\widetilde{y}_L$ and $\widetilde{y}_H$. Group size is given by $F(\widetilde{y}_H) - F(\widetilde{y}_L)$ since group membership is constituted by individuals who belong to the interval $[\widetilde{y}_L, \widetilde{y}_H]$.

- **Configuration 4**. $u_{cg} - u_{cc}$ is U-shaped in y. The **extremities** of the distribution of y join the group. The converse to Case 3 obtains when $\Phi_y < 0$ for relatively low values of y and $\Phi_y > 0$ for relatively high values of y. Given our assumption that (5) has at most two roots, participation condition (5) is U-shaped and the group is composed of individuals in $[\underline{y}, \widetilde{y}_L] \cup [\widetilde{y}_H, \overline{y}]$. Group size is given by $F(\widetilde{y}_L) + 1 - F(\widetilde{y}_H)$.

2.2 Applying the Median Voter Theorem

To close the model, we need to determine the collective choice of t. A simple way of doing this is to apply the Median Voter Theorem. Let y^m be the income of the median voter. The choice of $t^*(y^m)$ is given in implicit form by FOC (2) evaluated at $\widehat{y} = y^m$:

$$-u_c(y^m - t^*, t^*) + u_g(y^m - t^*, t^*) = 0. \tag{7}$$

y^m is the median value of y for group members defined over the interval: $[y^*, \overline{y}]$ for Configuration 1; $[\underline{y}, y^*]$ for Configuration 2; $[y^*_L, y^*_H]$ for Configuration 3; and $[\underline{y}, y^*_L] \cup [y^*_H, \overline{y}]$ for Configuration 4 – where y^*, y^*_L and y^*_H denote the endogenously-determined limit types.

Given the choice of t by the median group member, participation condition (4) is obtained by replacing $\widehat{y}$ with y^m. The limit values y^* of y that determine group membership are the roots of:

$$\Phi(y^m, y^*) = u(y^* - t(y^m), t(y^m)) - u(y^*, 0) = 0. \tag{8}$$

To solve for equilibrium group membership, we combine equation (8) with the appropriate definition of median group member, which varies with the type of equilibrium configuration:

$$\text{Case 1} \;:\; 1 - F(y^*) - 2F(y^m) = 0, \tag{9}$$

$$\text{Case 2} \;:\; F(y^*) - 2F(y^m) = 0, \tag{10}$$

$$\text{Case 3} \;:\; F(y^*_H) - F(y^*_L) - 2F(y^m) = 0, \tag{11}$$

$$\text{Case 4} \;:\; F(y^*_L) + 1 - F(y^*_H) - 2F(y^m) = 0. \tag{12}$$

For instance, in configuration 1, we combine equation (9) with equation (8) to get a system with two unknowns, y^m and y^*. Solving for y^m and y^* gives the equilibrium group membership under configuration 1. Under cases 3 and 4, equation (8) has two roots, which are the values y_L^* and y_H^* used in their respective median definition. We denote the solution (or solutions in cases 3 and 4) to the above system of equations as:

$$\Phi(y^m(y^*), y^*) = 0. \tag{13}$$

3 Empirical strategy

We derive an empirical strategy building on the prediction of the theoretical model. We begin with group membership regressions before turning to co-membership analysis.

3.1 Membership regressions

The CBO provides a bundle of goods and services to its members. The net value of this bundle varies across individuals i, as determined by the participation condition $\Phi(y^m(y^*), y) = u\left(y - t(y^m(y^*)), t(y^m(y^*))\right) - u\left(y, 0\right) \geqslant 0$, where y^* is defined by equation (13). Heterogeneity across individuals is easily introduced by allowing utility to depend on a vector of household characteristics x:

$$u(c, g, x) = u\left(y - t, t, x\right),$$

Given that y in general depends on household characteristics x, we can write:

$$u(c, g, x) = u\left(y(x) - t, t, x\right).$$

The participation condition (4) evaluated at the group membership equilibrium ($\widehat{y} = y^m(y^*)$) becomes:

$$\begin{aligned} \Phi(y^m(y^*), x) &= \Phi(y^m(y^*), y(x), x) \\ &= u\left(y(x) - t(y^m(y^*)), t(y^m(y^*)), x\right) - u\left(y(x), 0, x\right) \geqslant 0. \end{aligned} \tag{14}$$

For instance, a CBO providing agricultural extension is more valuable to farmers, in which case $\Phi(y^m(y^*), x)$ is larger for farmers. Similarly, the opportunity cost of attending group meetings is likely to be larger for households with a higher dependency ratio (i.e., number of children per adult), so that $\Phi(y^m(y^*), x)$ is lower for them.

If there are no constraints on group size and membership, equation (14) captures all the information that is relevant for group formation. Let $D_i = 1$ if household i belongs to the CBO and assume that the gain from group membership can be approximated as $\Phi_i \equiv \Phi(y^m(y^*), x_i) = \beta x_i - \varepsilon_i$ where ε_i is an error term. We have:

$$\begin{aligned} \Pr(D_i = 1) &= \Pr(\Phi_i \geq 0), \\ &= \Pr(\varepsilon_i \leq \beta x_i), \end{aligned} \tag{15}$$

Equation (15) states that a household is in a group if the net benefits $\Phi(y^m(y^*), x_i)$ from joining are positive. In the empirical analysis we assume that ε_i follows a logistic distribution.

Regression (15) tells us whether household characteristics x_i differ systematically between CBO members and non-members. For instance, it can tell us whether CBO members are systematically wealthier than non-members, or whether members of a specific ethnic group are more likely to belong to a CBO. To the extent that household characteristics are correlated with each other, a multivariate regression such as (15) can tell us whether the observed relationship between, say, ethnicity and CBO membership disappears once we control for wealth and family ties with village authorities.

For regression (15) to be meaningful, we must adequately control for household size. The reason is that each (adult) household member can, in principle, join a CBO. The likelihood that at least one member of a household belongs to a CBO therefore increases with household size and composition, which we control for in the analysis.[9]

[9] The question arises of what functional form to select. To work this out, let p be the probability that an individual belongs to a CBO. If membership is independent across individuals in the same household, the probability that at least one household member belongs to a CBO is $1 - (1-p)^N$, where N is the size of the household. In contrast, if membership is perfectly correlated across household members, Pr(at least one member) $= p$. Generalizing from the above, the probability can be approximated as

$$\Pr(\text{at least one member}) \approx 1 - (1-p)^{N^\delta} \tag{16}$$

where $\delta \leq 1$ measures the extent to which outcomes are correlated within households. If we let $p = \frac{e^{x\beta}}{1+e^{x\beta}}$, can we find a way of writing a logit regression model that approximates (16)? Numerical experimentation

So far we have assumed that if a household wishes to join a group, it can. Limits to group size may nevertheless exist, in which case not all potential beneficiaries are able to join their preferred group. In this case, some rationing mechanism will determine membership for those who want to join. It is beyond the purpose of this paper to investigate the equilibrium configurations that may emerge. We simply note that if, in equilibrium, some households are excluded purely at random, then nothing other than x_i should predict group membership. If, however, households with characteristics z_i are less likely to join – either because they self-exclude or because they are prevented to join – then the data generating process takes the form:

$$\Pr(D_i = 1) = \Pr(\varepsilon_i \leq \beta x_i + \gamma z_i), \tag{17}$$

with $\gamma \neq 0$. If we know which characteristics enter vector x_i and which do not, we can test for bias in group membership according to z_i. In our data, we only have circumstantial evidence about which variables can be excluded from x_i, so we must refrain from drawing any strong inference about discrimination. But we can document bias.

We can also test whether there is any evidence of limits to group size as follows. Suppose there are M CBOs in the village. If all villagers are free to join any group, the number of groups M and the number of individuals in the village V should not affect $\Pr(D_i = 1)$. But if, for whatever reason, there is a constraint on group size, joining a group will be more difficult when M/V is small.[10] This can be tested by including $\log M/V$ as an additional regressor.

If CBO membership is correlated within households, the average household size V/H

reveals that, for values of N in the relevant range, a rough approximation can be found as:

$$1 - \left(1 - \frac{e^{x\beta}}{1+e^{x\beta}}\right)^{N^\delta} \approx \frac{e^{x\beta+\delta\log(N)}}{1+e^{x\beta+\delta\log(N)}}$$

This means that adding $\log(N)$ in regression (15) is an effective manner of controlling for the effect of household size on the probability of group membership at the household level.

[10] To illustrate this possibility, suppose that, among those who wish to join a CBO, only a proportion $\sigma M/V$ can join; the others are rationed out. We have $\Pr(member) = p\sigma\frac{M}{V}$. Letting $\Pr(member) = \frac{e^a}{1+e^a}$, we get:

$$\begin{aligned} a &= \log\frac{p\sigma\frac{M}{V}}{1-p\sigma\frac{M}{V}} \\ &\approx \log p + \log\sigma + \log(M/V) + p\sigma M/V + O^2 \end{aligned}$$

Given that M/V is typically a small number, variation in a is driven primarily by $\log(M/V)$. Hence adding $\log(M/V)$ in (15) controls for limits on group size. If this term has a positive coefficient, group size is constraining.

matters as well, with H the number of households in the village. If group size is constraining and correlation within households is perfect so that if one household member belongs, all do, then household membership only depends on $\log(M/H)$, not on $\log(M/V)$. If correlation is imperfect, both matter. Imperfect correlation in CBO membership within households can thus be captured by including $\log(M/V)$ and $\log(V/H)$ in (17). If membership is independent within households, the coefficient associated with $\log(V/H)$ will be equal to 0. In contrast, if membership is perfectly correlated within households, membership depends only on $\log(M/H)$, which implies that the coefficients associated with $\log(M/V)$ and $\log(V/H)$ should be equal.[11] This can easily be tested.

We also wish to consider the possibility that CBOs are dedicated to a specific interest group or activity. The probability that an individual finds a group catering to his or her special interest therefore increases with the absolute number of groups in the village. To capture this possibility, we include $\log M$ as a separate regressor. If the coefficient associated with $\log M$ is positive, this suggests that group diversity matters.

Empirical model (17) is consistent with generalizations of our theoretical model that allow for dependence on group size and for the existence of multiple groups (under certain conditions). For instance, suppose that preferences depend upon aggregate member contributions tN, as well as group size N:

$$u\left(y-t,tN,N\right)$$

Dependence on N captures economies of scale in group size or congestion effects.[12] Proceeding in the same manner as in section 2 leads to an equilibrium condition (the counterpart of equation (8)) of the form:

$$\Phi(y^m,y^*)=u\left(y^*-t(y^m),t(y^m)\left(1-F(y^*)\right),1-F(y^*)\right)-u\left(y^*,0,0\right)=0,$$

[11] We need to show that:

$$\eta\log(M/H)=\eta\log(M/V)+\eta\log(V/H)$$

We have:

$$\begin{aligned}\eta\log(M/V)+\eta\log(V/H) &= \eta\log M-\eta\log V+\eta\log(V)-\eta\log(H)\\ &= \eta\log M-\eta\log H\\ &= \eta\log(M/H)\end{aligned}$$

[12] It is conceivable that the group imposes an externality – positive or negative – on non-members. We ignore this possibility here.

for Case 1. Corresponding expressions can be derived for the three other cases.[13] Membership regression model (17) nevertheless remains valid. To see this, note that equilibrium condition (14) now becomes:

$$\Phi(y^m(y^*), x) = u\left(y(x) - t(y^m(y^*)), t(y^m(y^*))\left(1 - F(y^*)\right), 1 - F(y^*), x\right) - u\left(y(x), 0, 0, x\right) \geqslant 0 \tag{18}$$

The only exogenous variable in this expression is x; everything else is endogenously determined in equilibrium. Equation (17) can thus be seen as a reduced-form, linear approximation to (18).

The theoretical model can also be generalized to allow for multiple memberships in groups providing different club goods, without leading to any substantive change in the empirical specification. For instance, imagine that one group provides agricultural services while another provides mutual insurance. Some households may wish to join both, others may wish to join none or only one of the two. For example, if two groups, A and B, are available, one can write preferences as:

$$u(c, g_A, g_B) = u\left(y - t_A - t_B, t_A, t_B\right)$$

If we are willing to assume that the cross-partial derivative of one public good (e.g., agricultural services) does not change with the other public good (e.g., mutual insurance), i.e., as long as $u_{cg_Ag_B} = 0$, the testing strategy is unaffected.

3.2 Dyadic regressions

Households may have preferences on group composition that affect who groups with whom. In the model this can be captured by making $\Phi(.)$ a function not only of i's characteristics but also of the characteristics x_{-i} and z_{-i} of other individuals in the group, e.g.:

$$\Phi = \Phi(y^m(y^*), x_i, z_i, x_{-i}, z_{-i}) \tag{19}$$

[13] In more general models such as this one, other equilibrium configurations can also arise. For an illustration of how complex equilibrium group configurations can become in models of group formation, the reader is referred to Genicot and Ray (2003) who analyze a mutual insurance group formation model with coalition-proof equilibria.

The net benefits function (19) includes many possibilities. For instance, households may prefer to group with similar individuals – e.g., from the same gender, ethnicity, or social status. This is commonly referred to in the literature as homophily – i.e., 'loving the same'. In this case, two individuals with similar characteristics z_i and z_j are more likely to be in the same group. Assortative matching may also arise as an equilibrium of the group formation process, as in Case 3 – which displays positive assorting – or in Case 4 – which displays negative assorting.

Regression analysis based on (15) or (17) cannot test for assortative matching. To illustrate this, imagine that individuals come in two types z – blue and green – and that there are two groups in the village. Further suppose that all individuals are equally likely to be in a group. We wish to test homophily by color, i.e., whether the blue and the green are segregated. Equation (17) is of no help given that blues and greens are equally likely to belong to a group.

To test assortative matching, we need a *dyadic* approach. Let $D_{ij} = 1$ if households i and j are in the same group, and 0 otherwise. To simplify the notation, let vector $w_i \equiv \{x_i, z_i\}$. We write:

$$\Pr(D_{ij} = 1 | D_i = 1 \text{ and } D_j = 1) = \Pr(\alpha + \theta|w_i - w_j| + u_{ij} > 0) \tag{20}$$

where $|w_i - w_j|$ is the absolute difference in characteristic w. If i and j share the same color, $|w_i - w_j| = 0$; if they do not, $|w_i - w_j| > 0$. Hence if $\theta < 0$ this means that blues group with blues and greens with greens.

In regression model (20) both i and j belong to a group. We also want to investigate situations in which some people belong to a group and others do not. We wish to test whether people in the group are more alike than people not in the group, as in Case 3. Alternatively, as in Case 4, CBO members could come from opposite ends of the distribution, as would arise for instance if the CBO helps poor and rich households pool complementary resources – e.g., land and labor – for a common purpose.

To investigate these issues, we turn to a dyadic model of the form:

$$\Pr(D_{ij} = 1) = \Pr(\theta|w_i - w_j| + \eta(w_i + w_j) + u_{ij} > 0). \tag{21}$$

Regression model (21) contains two kinds of regressors: absolute differences $|w_i - w_j|$ and sums $(w_i + w_j)$. Combining these different types of regressors makes it possible to distinguish a Case 1 (or 2) configuration – where members have a higher (or lower) w than non-members – from a Case 3 (or 4) configuration – where members have a more similar (or more dissimilar) w than non-members.

Regressors of the form $|w_i - w_j|$ identify negative and positive assortative matching. A negative θ means that members of the same group are more similar to each other than to the rest of the population, as in case 3: a larger $|w_i - w_j|$ makes it less likely that they belong to the same group. A positive θ implies negative assorting: people in the same group are more different than the population at large, as in case 4.

Regressors of the form $(w_i + w_j)$ capture the propensity for an individual household to join a group conditional on w, i.e., they mimic the regressors entering (17). To demonstrate this, imagine that there is a single group. In this case, $D_{ij} = D_i D_j$. Hence $\Pr(D_{ij} = 1) = \Pr(D_i D_j = 1)$. If there is no assortative matching so that $\theta = 0$, $\Pr(D_i = 1)$ is independent of $\Pr(D_j = 1)$. From (17) we can write $\Pr(D_{ij} = 1) = \Pr(\varepsilon_i \leq \beta x_i + \gamma z_i) \Pr(\varepsilon_j \leq \beta x_j + \gamma z_j)$. If ε_i and ε_j follow a logit distribution, as we assume in the empirical analysis, we have:

$$
\begin{aligned}
\Pr(D_{ij} = 1) &\approx e^{\beta x_i + \gamma z_i} e^{\beta x_i + \gamma z_i} \\
&\approx e^{\beta(x_i + x_j) + \gamma(z_i + z_j)}
\end{aligned}
$$

which shows that, in this case, $\Pr(D_{ij} = 1)$ boils down to:[14]

$$
\begin{aligned}
\Pr(D_{ij} = 1) &= \Pr(\beta(x_i + x_j) + \gamma(z_i + z_j) + u_{ij} > 0) && (22) \\
&= \Pr(\eta(w_i + w_j) + u_{ij} > 0) && (23)
\end{aligned}
$$

Combining $(w_i + w_j)$ and $|w_i - w_j|$ terms makes it possible to tell apart configurations 1 and 2 – when members have a higher (or lower) w than non-members – from configurations 3 and 4 – where members have a more similar (or more dissimilar) w than non-members. To illustrate this, imagine that we are in Case 3 but there are slightly more villages with

[14] If there are multiple groups, or groups of different sizes, $(z_i + z_j)$ and $(x_i + x_j)$ will capture the propensity for i and j to belong to more groups or to larger groups. In this case β and γ will not be identical to η_x and η_z.

group members on the upper end of the w distribution. If we simply estimate (17), we will erroneously conclude that we are in Case 1, i.e., that groups are elitist in terms of w. When we estimate dyadic regression (21), however, the $|w_i - w_j|$ regressor picks up the presence of villages in which members all have a low, or all have an average, x. Comparing the $(w_i + w_j)$ and $|w_i - w_j|$ coefficients tells us whether we are either in Case 1 (or 2) or in Case 3 (or 4). By the same reasoning, regression (21) can also distinguish between Case 1 (or 2) and Case 4. To summarize, regression analysis based on (15) or (17) can usefully identify characteristics that predict group membership. But it cannot uncover patterns of positive or negative assortative matching. This must be done using regression analysis based on (20) and (21).

As we have pointed out, homophily is not the only reason why people may be positively assorted. While the theoretical literature on equilibrium group matching processes is still in its infancy, there is a well developed literature on matching in pairs. In his seminal analysis of marriage markets, Becker (1981) notes that, if all brides and all grooms have identical preferences and rank each other the same way, positive assortative matching is the only stable equilibrium outcome. So for instance if all grooms and all brides prefer to marry someone wealthier, in equilibrium the rich marry the rich and the poor marry the poor. In other words, the outcome is observationally similar to what would arise with homophily, and corresponds to what we observe in Case 4 of our theoretical model. Belot and Francesconi (2006), Hitsch, Hortacsu and Ariely (2005) and Fisman, Iyengar, Kamenica and Simonson (2006) test for homophily and assortative matching in pairwise matching data. Given that we have no information on individual preferences, we should refrain from interpreting evidence of assortative matching as implying homophily.

There are few network or group formation models that explore assortative matching in an equilibrium context. An exception is Vandenbossche and Demuynck (2010) who present a simple model of network formation with assortative matching. The authors show that, in equilibrium, individuals who are peripheral to the village end up being excluded from a network of mutual insurance because more central individuals are better sources of insurance. Applied to our setting, this would imply that households located at the social or geographical periphery of the village are less likely to belong to a group.

3.3 Donor funding

If households with certain characteristics are less likely to belong to a CBO, this would reduce the effectiveness of donors in reaching individuals with those characteristics – irrespective of why these individuals do not belong to the CBO. Similarly, assortative matching is likely to affect how effectively donors reach their target audience. For instance, if the wealthy and the poor join different CBOs, efforts directed at redistributing resources within CBOs will not fully redistribute resources within the village as a whole.

It is also conceivable that donor funding affects group formation. To illustrate this, let us add external funding to the model. The limit type defined by (13) is now given by:

$$\Phi(y^m(y^*), y^*) = u\left(y^* - t(y^m(y^*)), t(y^m(y^*)) + G\right) - u\left(y^*, 0\right) = 0,$$

where G is the injection of external funds. Consider the comparative statics of the limit type(s) y^* with respect to an external injection of funds G. Applying the Implicit Function Theorem to the participation condition yields:

$$\frac{dy^*}{dG} = -\frac{u_g\left(y^* - t(y^m\left(y^*\right)), t(y^m\left(y^*\right)) + G\right)}{\frac{\partial}{\partial y^*}\left[u\left(y^* - t(y^m\left(y^*\right)), t(y^m\left(y^*\right)) + G\right) - u\left(y^*, 0\right)\right]}. \tag{24}$$

It follows that

$$sign\left[\frac{dy^*}{dG}\right] = sign\left[-\frac{\partial}{\partial y^*}\left[u\left(y^* - t(y^m\left(y^*\right)), t(y^m\left(y^*\right)) + G\right) - u\left(y^*, 0\right)\right]\right]. \tag{25}$$

One can then prove the following:

Proposition 1 *(i) Under Case 1 (high y individuals join the group), group membership is increasing in external funds. (ii) Under Case 2 (low y individuals join the group) and Case 3 (the middle of the distribution of y joins the group), the effect of external funding on group membership is in general ambiguous. (iii) In Case 4 (the extremities of the distribution of y join the group) there are two possible results: (a) if the median member y^m belongs to the subgroup of low y individuals, the effect of external funding is ambiguous;(b) if the median member y^m belongs to the subgroup of high y individuals, group membership is increasing in external funds.*

Proof: see online Appendix.

Proposition 1 shows that external funding makes CBOs more inclusive in case 1, when the CBO groups individuals with a high y, and case 4 when the group is made principally of high y individuals. These are two cases in which, without external intervention, the CBO tends to be more elitist. In the other cases, when the CBO is less elitist, the effect of donor funding on group membership is ambiguous.

We investigate in the empirical section whether donor-funded groups are more or less exclusive than non-assisted ones. We also test whether there is more or less evidence of assortative matching in CBOs that are assisted by external donors. Formally, let $A_i = 1$ if the group to which i belongs receives assistance from an external donor. We estimate models with interaction terms of the form:

$$\Pr(D_i = 1) = \Pr(\varepsilon_i \leq \beta x_i + \gamma z_i + \beta_A x_i A_i + \gamma_A z_i A_i)$$

and similarly for $\Pr(D_{ij} = 1)$. If $\beta_A \neq 0$ and $\gamma_A \neq 0$, this constitutes evidence that assisted CBOs have a different membership from non-assisted ones. By itself, this do not tell us anything about the direction of causation. But irrespective of the direction of causation, it is still of independent interest whether donor-assisted CBOs are systematically different from others. For instance, if we find evidence of assortative matching in non-assisted CBOs but not in assisted CBOs, donors should be less concerned that systematic biases in CBO membership may bias who receives assistance.

4 The data

The data stem from a large scale survey of 250 villages in Senegal and 289 villages in Burkina Faso. The surveys were undertaken in 2002 under the auspices of the World Bank. In Senegal, the survey was organized in tight collaboration with a branch of the principal national peasant organization, the *Association Sénégalaise pour la Promotion des Petits Projets de Développement à la Base* (ASPRODEB). In Burkina Faso, where no such strong national federation exists, the survey was organized in the context of the *Projet National de Développement des Services Agricoles* (PNDSA II), funded by the World Bank.

Community-based organizations (CBOs) – or *groupement,* as they are called by surveyed farmers – are common in the two study countries. In Senegal, there is a long tradition of CBO activity going back to the pre-independence period (see Ba, Ndiaye, and Sonko (2002) or Faye and Ndiaye (1998) for good summaries). In contrast, the Burkinabe peasant movement is a relatively recent development, spurred on in part by the terrible drought of 1973, and especially by the progressive withdrawal of the state from rural areas in the early 2000s. For the purpose of the surveys, a CBO is defined as an organization created by villagers to provide services to its members.[15] In practice, this definition corresponds closely to the term *groupement* used by villagers.[16]

In each village, an informant was hired who, under the supervision of village inhabitants, carried out a census of *all* households, for whom he collected information on socio-demographic variables and on their participation in village CBOs.[17] Separate questionnaires cover village infrastructure and CBO activities. Details on the surveys, carried out almost contemporaneously in Senegal and Burkina Faso, can be found in Arcand (2004) and DeJanvry and Sadoulet (2004).

The Senegal survey covers three geographical areas (the Senegal river basin, the so-called "peanut basin", and the area known as the *Niayes*) selected to get as broad a coverage as possible of CBO activities. The survey design involves stratified sampling, with 19 sub-regional clusters (corresponding to a Senegalese administrative district known as a *communauté rurale*) and 250 villages.

The Bukina Faso survey covers three broad regions: (i) the cotton region (mainly Comoë, Tapoa and Nahouri) where living standards are usually higher than in the rest of the country and CBOs are often due to intervention by Sofitex (the national cotton marketing corporation); (ii) the central Mossi plateau, which is quite arid and where traditional organizations are likely to be predominant; and (iii) the Oudalan region, which is ecologically a near-desert, where livestock constitutes the main activity, and where the Fulani, Twareg, and Bella ethnic groups are predominant. As in Senegal, the Burkina Faso survey involved stratified

[15] Many CBOs carry out activities, such as village cleanups, that benefit everyone. But this is not their primary purpose.

[16] Mutual aid societies such as *tontines* (ROSCAs) are not regarded as CBOs for the purpose of this study, even though a *groupement* may set up a *tontine* as part of its multiple activities.

[17] As in most other surveys, a household is defined as a group of individuals whose meals are organized by one person (the household head). In most cases, the members of a household live within the same compound.

sampling, with 22 clusters at the *département* level, and approximately 14 randomly-drawn villages per cluster, yielding a total of 289 villages, 21 of which were subsequently dropped due to incomplete data. A little over 20,000 households were interviewed in the two countries – 12,212 in Burkina Faso and 8,415 in Senegal.

Table 1 summarizes the main characteristics of the Senegal and Burkina Faso household surveys. The average sample household has 7.5 members in Burkina and close to 10 in Senegal. A small proportion of households are headed by women. The education level of surveyed household heads is very low, and many of them are illiterate. Surveyed households own on average around 3 hectares (7.5 acres) of land and a number of farm animals – mostly goats and sheep.

Asked to rank their economic status on a scale from 1 (very poor) to 4 (rich), respondents in both countries gave themselves an average ranking of 2=poor. Respondents were also asked whether they have family ties to various village authorities, such as the village chief, a religious leader, a *marabout*, or some other traditional authority figure. On the basis of their answers we construct an index of family ties with village authorities. This index takes values from 0 (no family ties to any village authority) to 4 (family ties to four different categories of village authorities). The average value of the index is 1, meaning that most respondents have family ties with some of the village authorities.

CBO membership is detailed next. Over half of the surveyed households in Burkina Faso – and nearly three quarters of them in Senegal – have at least one member belonging to a CBO. Two-fifths to one half of surveyed households have at least one male CBO member. In Burkina, less than a third of surveyed households have at least one female CBO member; in Senegal two thirds of households do.

In both countries we observe a lot of ethnic diversity, with no ethnic group accounting for more than one third of the sample. Ethnic diversity is less pronounced within villages, however. In this region of West Africa, the Fulani (locally known as *Peuhl*) and the Twareg (also known as *Tamachek*) traditionally emphasize livestock raising. The Fulani are found in both survey countries.

Table 2 reports some relevant characteristics of the surveyed villages. The number of households per village varies from 100 to 200. The average number of inhabitants is around

1000. Using data on ethnic composition from the village questionnaire, we computed the ethnic fractionalization index for each village. The index takes values from 0 (perfect homogeneity) to 1 (extreme fragmentation). Results show that both countries exhibit significant ethnic heterogeneity, but villages in Senegal are on average more ethnically homogeneous than in Burkina.

The two surveyed areas are characterized by an abundance of CBOs. In Burkina Faso, each surveyed village has an average of 3.2 CBOs. In Senegal the average is slightly lower, at 2.4. Surveyed villages are frequent recipients of government, donor, or NGO funding, with almost 60% of CBOs in both countries having some form of external partnership. The detail of these partnerships is presented in Table 3: in Senegal, the predominant role is played by NGOs or international donors, whereas the breakdown is more even in the Burkinabe case. Table 3 also details the variety of activities carried out by CBOs: on average a CBO, irrespective of the country, is engaged in roughly two different activities. A collective field is the most prominent CBO activity in Burkina. This collective field is often used as a local "experimental station", seldom for income-generation. Income-generating agricultural activities (such as garden vegetables) come in second. In Senegal, collective fields are less important, but income-generating agricultural and non-agricultural activities are more present in terms of CBO activity. The provision of social and public goods (such as village cleanup efforts) is present in roughly one fifth of CBOs in both countries.

Table 4 breaks down households between CBO members and non-members and reports t-tests for all variables. A few villages with no CBO are dropped so as to only compare households with access to CBO membership. We have taken the log of variables with a skewed distribution (i.e., household size and wealth) to avoid test results driven by outliers. Results show that, on average, CBO members unambiguously come from larger, wealthier households. They have closer family ties with village authorities and are less likely to be headed by a woman. This is true in both countries and the difference is highly significant, albeit not always large in magnitude.

We also note some differences in CBO membership across ethnic groups. In Senegal, over 95% of the Toucouleur belong to CBOs compared to 85% for the average household. The Fulani and Serere are less likely to belong to a CBO. Similar difference are found in Burkina

Faso, where the Fulani, Bissa, and Gourmatche are less likely to belong to a CBOs. Because of the emphasis many Fulani put on livestock raising, they tend to live at the outskirts of the village so as to facilitate access to pasture and minimize crop destruction. Fulani culture is often believed to be more individualistic and less centered on the overall community than is that of other ethnic groups. These factors may explain why they are under-represented among CBO members.

Turning to differences in village characteristics, we see that, as expected, CBO members tend to live in villages where average household size V/H is larger and where the density M/H of CBOs per inhabitant is higher. The relationship between other village characteristics and CBO membership varies between the two countries with no identifiable pattern.

5 CBO membership regressions

We begin by estimating membership regression (17). We wish to investigate whether CBO membership represents all sectors of rural society or whether wealthier and better connected households are more likely to belong to a CBO – as in Case 1 in the theoretical model. Our main objective is thus to test whether various components of wealth and social status are associated with CBO membership. As indicated in Section 4, we are also interested to test whether there are limits to group size. To this effect we begin by presenting regression results that control for village characteristics such as the number of CBOs/villager $\log(M/H)$, average household size $\log(V/H)$, and group diversity $\log M$. To reduce the risk of omitted variable bias, we control for other village characteristics that may be important determinants of the returns to joining a CBO.[18] We also control for household size and composition as they are likely to affect group membership: the larger a household is and the larger the share of adults, the more likely it is to belong to a CBO.

Results are presented in Tables 5A and 5B. Three sets of regression results are presented. In the first column, the dependent variable takes the value 1 if any member of the household

[18] Wells can be used for horticulture, and we see that villages differ in terms of the number of wells they have. Electricity can be used to power irrigation pumps. The data show that very few Burkinabe villages have electric power, but up to one fifth of surveyed Senegalese villages do. The sale of agricultural surplus is facilitated if producers have easy access to a market outlet. The data show that only a quarter of all surveyed villages have a village market. Production for the market is hindered in villages that, during the rainy season, are isolated from the rest of the country by impassable roads. The data show that surveyed villages vary along this dimension as well.

belongs to a CBO. In the second column, the dependent variable is 1 if any male member of the household belongs to a CBO. The third column is the same as column two, but for female membership. The estimator is logit. Robust standard errors corrected for village clustering are reported in all cases.

Results show a significant positive association between wealth or social status and CBO membership, albeit with some variation across regressions and countries. Land ownership is significantly positive in four out of six regressions. This means that CBO members have on average more land than non-members, a finding reminiscent of Case 1 in the model. Family ties with village authorities are highly significant in the three Burkina regressions but in none of the Senegal regressions. This suggests that proximity to village authorities is strongly associated with CBO membership in Burkina Faso but not in Senegal. We also find a strong association between ethnicity and CBO membership.

Distance from the village center is negatively associated with membership in Burkina: household that live closer to the village center are more likely to belong to a CBO. This is not true in Senegal. Female headed households are less likely to belong to a female CBO in both countries, possibly because female CBOs do not cater to their needs. Female headed CBOs are not, however, significantly less likely to belong to CBOs in general. We also find that households with a young head are more likely to belong to a CBO in three of the six regressions. But there is no evidence that better households with a better educated head are more likely to belong to CBOs.

As explained in Section 3.1, Tables 5A and 5B also contain information about correlation in group membership across household members. To recall, if group membership is independently distributed across household members, then we must find a 0 coefficient for $\log(V/H)$, the log of average household size in the village. This is not what find in Burkina. The evidence is less strong in Senegal, with all coefficients positive but none significantly different from 0 even at the 10% level. If group membership is perfectly correlated within households, membership depends only on $\log(M/H)$, which implies that the coefficient of $\log(M/V)$ (number of CBO per inhabitant) and $\log(V/H)$ (average household size) should be equal. In none of the six regressions can we reject the hypothesis that the coefficients of $\log(M/V)$ and $\log(V/H)$ are equal. Individual coefficients are not estimated very precisely, however, so that the evidence of perfect correlation is not strong – we could probably equally fail to reject that it is 0.8 or another large number less than 1. Since the coefficient associated with household size $\log N$ is itself significant in all regressions but one, the lesson we draw is that there is a strong but imperfect correlation in membership across household members.

The Tables also contain indirect information regarding limits to group size. To recall, we showed in Section 3.1 that if there are no limits to group size, the coefficient associated with $\log(M/V)$ (number of CBOs per inhabitant) should be 0. This is not what we find: the coefficient is positive and significantly so in four out of six regressions. This suggests that there are constraints to group size: more populated villages need more groups to maintain the same (conditional) probability of membership. This effect is stronger in Burkina Faso, indicating that social exclusion may be stronger in that country. This finding is consistent with the strong association between CBO membership and family ties with authorities also observed for Burkina Faso.

Finally, we argued that if the coefficient associated with $\log M$ is positive, this suggests that households are more likely to belong to a CBO if there is a greater diversity of groups, possibly catering to different special interests. We find little conclusive evidence to this effect: the coefficient associated with $\log M$ is significantly positive in one Senegal regression, but significantly negative in two others.

Results reported in Tables 5A and 5B may be affected by unobserved village heterogeneity. To control for this possibility, we reestimate equation (17) with village fixed-effects. Robust standard errors are reported. Results are presented in Table 6 for combined male and female membership; other regressions are omitted to save space. Results are in general stronger, confirming that unobserved village heterogeneity is an issue. We now find that land ownership is significant in all regressions and that family ties with village authorities are significant in five out of six regressions. The magnitude of the coefficient remains larger in Burkina Faso, however.

The results confirm that the relationship between ethnicity and CBO membership cannot be fully explained either by land wealth – which is captured explicitly in the regression – or by differences in ethnic composition across villages – which are captured by village fixed effects. There is a systematic association between ethnicity and CBO membership within villages.

Whether this is due to discrimination or self-selection is unclear. In Burkina Faso, the two groups that are negatively affected – the Fulani and the Twareg – traditionally specialize in livestock raising. A similar result is found for Fulani in Senegal. The difference in professional focus may explain part of the variation in CBO membership across ethnic groups.

Table 7 gives some idea of the magnitude of the association between different regressors and the likelihood of being a CBO member. For continuous covariates we report the marginal effect of a one standard deviation change in the explanatory variable. For dummy variables, we report the marginal impact of going from 0 to 1. The Table indicates which regressors are dummy variables.[19] The predictive power of ethnic factors is confirmed. For example, in the case of Burkina Faso, being Twareg decreases the likelihood of CBO membership by 23.3 percentage points overall. Similarly large effects are found in both countries for Fulani, especially for membership in male CBOs.

An increase of one standard deviation in family ties with village authorities increases the likelihood of belonging to a CBO by almost 4.8 percentage points in Burkina Faso, but much less in Senegal. The impact of a one standard deviation change in owned land, on the other hand, is relatively small (+2.2 and +1.8 percentage points in Burkina Faso and Senegal, respectively). Although it affects only a minority of households in the sample, the female head dummy also have a large effect in magnitude. In both countries having a female head is associated with a strong reduction in membership in female CBOs: -8.5 and -6.2 percentage points in Burkina Faso and Senegal, respectively. The effect on membership in male CBOs is different, however: strongly negative in Burkina Faso but positive in Senegal.

If we consider there results in the light of the theoretical model and discussion in Section 4, the evidence suggests that the group configuration in the majority of sampled villages corresponds to Case 1. This is a case corresponding to $u_{cg} > 0$, that is, when the marginal gain from joining the group rises with y where y, in this case, is owned land. The evidence therefore suggests that the type of public goods that CBOs provide is most useful to farmers. This is not surprising given that most CBOs in the studied villages focus on agriculture-related public goods.

More disturbing is the finding that households better connected with village authorities

[19] These effects correspond to the village fixed effects specifications given in Tables 6A and 6B. Marginal effects are reported at the mean of the regressors.

are more likely to belong to a CBO. Once we control for owned land, it is hard to imagine a mechanism by which, in an egalitarian world, being better connected would raise the material return from group membership so that $u_{cg} > 0$. But better connected households may derive more benefit if gains from group membership are unequally allocated among members. It is also possible that better connected households band together and exclude others, willingly or unwillingly. This is also what the strong ethnic dummies suggest: some members of the community are less likely to join CBOs for reasons that may have little to do with relative benefits from group membership u_{cg}. This interpretation receives some additional support from the finding that, in Burkina, CBO membership is less likely for female-headed households or for households residing further away from the village center: although we cannot rule out the possibility that these individuals would benefit less from CBO membership, we suspect that, if anything, they would probably benefit more.

6 Dyadic regressions

The empirical analysis we have conducted so far can only distinguish Case 1 from Case 2, that is, situations in which CBO members have on average a higher (or lower) w than non members. It cannot identify w variables associated with a Case 3 (positive assortative matching) or Case 4 (negative assortative matching) configuration. It also may mistakenly lead us to conclude in favor of Case 1 (elitism) when in fact the data are better explained by case 3 (positive assorting) or case 4 (negative assorting).

To distinguish between these different cases, we estimate dyadic regression (21). The dependent variable m_{ijv} is equal to 1 if households i and j in village v belong to the same CBO, and 0 otherwise. As in the preceding section, we construct three dependent variables m_{ijv}. The first one is 1 if any member of households i and j belongs to the same CBO. The second (third) is 1 if both households have a male (female) member in the same CBO.

Table 8 presents descriptive statistics for the dyadic variables used in the analysis. The total number of possible pairs is large – close to 350,000 distinct pairs in Burkina Faso, half that in Senegal. Summary statistics reported in the Table show that the proportion of household pairs that belong to the same CBO is higher in Senegal than in Burkina Faso. This is particularly true for female membership. In both countries, a non-negligible proportion of household pairs have more than one CBO in common.

Next we present the regressors used in the analysis. Two distance measures w_{ijv} are used – physical distance[20] and a dummy that takes the value one if both household heads belong to the same ethnic group. We see that there is variation in physical distance. In contrast, most pairs of households share the same ethnicity. This is because villages are more ethnically homogeneous than the surveyed population as a whole.

The remaining regressors are divided into two groups: absolute differences and sums. These correspond to $|w_{iv} - w_{jv}|$ and $(w_{iv} + w_{jv})$ in equation (21). As explained in Section 4, $(w_{iv} + w_{jv})$ regressors play the same role as household characteristics in the membership regressions: they identify evidence of Case 1 or Case 2 configurations. A negative coefficient for a $|w_{iv} - w_{jv}|$ regressors signal positive assortative matching, as in Case 3, while a positive coefficient implies negative assorting, as in Case 4.

Tables 9A and 9B present coefficient estimates of dyadic regression (21).[21] In all regressions we control for village fixed effects. Standard errors are corrected for village clustering to allow for positive and negative correlation between across observations ((Fafchamps and Gubert 2006)). Results are in general similar across regressions and across countries. Geographical and ethnic proximity are significant in both countries: membership in the same CBOs is more likely for households that live close to each other and share the same ethnicity.

Turning to regressors in absolute difference, we find evidence of positive assorting (e.g., negative coefficients) along a number of dimensions, although with differences between the two countries. We find little or no evidence of negative assorting (Case 4).

In Burkina we find evidence of positive assortative matching (i.e., Case 3) on the age of the household head. This suggests that CBO membership tends to be composed of household heads who are either predominantly young or old. This is not what we would have observed if there was strong complementarity between age groups in the provision of the CBO club good. To see this, suppose that elders bring experience while younger members bring strength and dynamism. If the returns to experience increase in strength and vice versa, a CBO that

[20] Physical distance is computed as follows. For each village, a stylized map was constructed that locates each household in the village on a grid. On this grid are placed the *concessions* or *carrés* – blocks of households typically surrounded by a fence – that make up the village. Physical distance between two households is computed as the euclidian distance between their grid coordinates.

[21] Similar results obtain if we replace the dichotomous dependent variables with the number of common CBOs and apply a least squares regression with village fixed effects.

combine both types of members would be more productive because the characteristics young and old members bring complement each other. We find no such evidence in our data: if there is complementarity between age groups, it is more than counterbalanced by assortative matching on age.

In Burkina there is also positive assortative matching on ties to village authorities, indicating that well connected members of the community tend not to associate with poorly connected ones, and vice versa. This is discouraging as it suggests that CBO do not play a role in integrating more peripheral members of the community. This stands in contrast with findings reported for Zimbabwe by Barr, Dekker and Fafchamps (2010) using a different methodology.

In Senegal we find positive assorting on land. This may be due to the fact that some CBO cater to the needs of farmers while others do not. We also find positive assorting on the education of the household head, suggesting that better educated farmers tend to group together. This is disappointing because CBO members with little education may benefit from having educated individuals in their group. In Senegal we also find some weak evidence of negative assorting by distance from the village center, suggesting that CBOs integrate households that are located at the center and periphery of the village.

As predicted in Section 4.2, the coefficients of the $(w_{iv}+w_{jv})$ terms by and large reproduce earlier findings and are surprisingly similar across the two countries. As in Tables 5A and 5B we find that households with more land are more likely to belong to a CBO, confirming a Case 1 configuration with respect to land. In Burkina, households with many ties to village authorities are more likely to belong to a CBO. This result reinforces the evidence we reported earlier of positive assorting on ties with authorities: not only are better connected members more likely to belong to a CBO, they are also less likely to belong to CBOs with less well connected members of the village.

Similar results for age and gender are found in Senegal, but they are only significant in some regressions. In contrast, for Senegal we no longer find that households with stronger family ties to village authorities are more likely to belong to a CBO. This is the only result that is noticeably different from those obtained from membership regressions.

The dyadic regressions reported in Tables 9A and 9B include all households, even those who do not belong to a CBO. In these regressions, the dependent variable is zero either when i and j do not belong to the same group OR when they do not belong to any group. This is a meaningful approach since we are trying to understand how households join each other in CBOs. We nevertheless worry that the factors that affect membership in any group differ from those that affect which group household join, conditional on joining at least one group.

To investigate this possibility, we re-estimate Tables 9A and 9B only using households that belong to at least one CBO. This implies that all villages with a single group drop out of the analysis. To correct for possible self-selection, we use regressions from Table 6 (and their male-only and female-only counterparts) to construct household-specific Mills ratios R_i. We then include regressors of the form $|R_i - R_j|$ and $(R_i + R_j)$ into the dyadic regressions. The ethnicity dummies appearing in Table 6 serve as identifying selection variables.

Regression results, not shown here to save space, indicate that, except in one of the six regressions, Mills ratio variables are not significant. For Burkina Faso most of our earlier results are confirmed, except for a loss power probably due to the reduction in the number of observations. Positive assorting on ties with village authorities is confirmed. We continue to find positive assorting on distance, ethnicity, age, and female head dummy, but we also find some evidence of positive assorting on education. In Senegal, results are different. The evidence of positive assorting on ethnicity and on land ownership disappears. What remains is assorting on distance, education, and female headship. These findings confirm that CBOs tend to be more segregated by social status in Burkina Faso than in Senegal.

7 Donor-sponsored CBOs

The theoretical model presented in Section 4.3 predicts that external funding should make elitist CBOs (i.e., those corresponding to Case 1) more inclusive. The results reported so far indicate that CBO members indeed tend to be better-off than non-members under some critical dimensions. Evidence of elitism remains after we control for the possibility of assortative matching. We therefore would like to test whether donor-sponsored CBOs tend to be more inclusive than unsponsored CBO, as predicted by the model.[22]

[22] Unsponsored CBOs include a number of CBO that receive support from the national government, but the amount of financial support they receive tend to be much smaller than that given by external donors.

We have information on whether each CBO receives funds from an NGO or international development agency. One third of CBOs in Burkina Faso and 44% in Senegal receive donor funding. Using this information, we construct a dataset where the dependent variable $m_{ig} = 1$ if household i belongs to CBO g, and 0 otherwise. We modify regression model (15) into a regression of the form:

$$\Pr(m_{ig} = 1) = \lambda(\alpha x_i + \beta d_g x_i + \lambda_g + u_i) \tag{26}$$

where $d_g = 1$ if CBO g is donor-sponsored. We are interested the coefficient vector β to see whether the composition of donor-sponsored CBOs is different from those that do not receive donor funding. CBO fixed effects λ_g are included to control for group-specific unobservables.

Results are summarized in Table 10. Coefficient estimates for household characteristics are similar to those reported in Table 6 and need not be discussed further. Coefficient estimates for the $d_g x_i$ interaction terms show that donor-sponsored CBOs are more inclusive along some dimensions. In Burkina the Fulani are much less likely than other ethnic groups to belong to unsponsored CBOs; the difference is less sharp for donor-sponsored CBOs, although the combined $\alpha + \beta$ coefficient remains negative. In Senegal female-headed household are much less likely to belong to unsponsored CBOs, but they are more likely to belong to donor-sponsored CBOs. These results are encouraging as they suggest that, along these dimensions, donor-sponsored CBO are more inclusive.

Unfortunately, in Burkina Faso donor-sponsored CBOs appear more elitist than unsponsored ones in a number of other dimensions: members of donor-sponsored CBOs are even more centrally located in the village and have even more family ties to village authorities. They also tend to be older. These results suggest that financial support received from donors fails to fully redress the elitist tendencies that characterize CBOs in this country. In Senegal, we do not find that donor-sponsored CBOs are more elitist, but there is no indication that they are significantly less elitist either.

We similarly revisit the dyadic regressions and reestimate them separately for donor-sponsored and non-donor-sponsored group membership. If donor-sponsored CBOs are more inclusive, assortative matching should also be less important, and the coefficients associated with the difference terms $|w_{iv} - w_{jv}|$ should be smaller in magnitude and less significant in the donor-sponsored CBO regressions.

Results are summarized in Table 11. As before, village fixed effects are included in all regressions and standard errors are clustered by village. In Burkina Faso, we find stronger evidence of selection into CBOs based on land and family ties (Case 1 – see coefficients on sum of household characteristics). We also find more positive assorting on ethnicity, land, and ties with authorities in donor-sponsored CBOs (Case 3 – see coefficients of absolute differences in household characteristics). In CBOs that are not donor-sponsored, there is positive assorting on education, age, and female headship. There is no such positive assorting in donor-sponsored groups.

In Senegal results are more encouraging. Households with more land are more likely to belong to a donor-sponsored CBO (Case 1 – coefficient on sums), but the magnitude of the coefficient is marginally smaller than that for non-donor-sponsored CBOs. In contrast, we see that households with stronger ties with village authorities are significantly more likely to belong to non-donor-sponsored CBOs, not so for donor-sponsored CBOs. We find some evidence of positive assorting on land and age (Case 3 – see coefficient on absolute differences), but assorting on land is more significant and larger in magnitude for non-donor-sponsored CBOs. Finally, we find no evidence of assorting on ethnicity for donor-sponsored CBOs, while such evidence exists for the other CBOs. These results indicate that, at Senegal at least, donor-sponsored CBOs are more inclusive along several dimensions.

These results suggest that, in these two countries at least, donors have not managed to make the CBOs they sponsor fully inclusive, although there is evidence that, along some dimensions, donor-sponsored CBOs are more inclusive, especially in Senegal. Put differently, our results do not show donors to particularly favor village elites – only that donor involvement does not appear to eliminate the tendency to elitism that pervades the CBO sector in these two countries. This is especially true in Burkina Faso, less so in Senegal.

A final concern is that results might be partly driven by the specific activities undertaken by the CBOs, which might in turn be influenced by the preferences of external sponsors. If certain activities are associated with certain ethnic groups or social categories, this could yield the correlations that we have highlighted so far. For instance, if donors focus on agricultural CBOs, it would not be surprising to find that donor-sponsored CBOs are composed of household with more agricultural land.

To test this conjecture, we investigate whether CBO activities are systematically associated with different sponsoring arrangements. We wish to know whether donors focus on specific activities. We estimate a series of negative binomial regression in which the dependent variable is an indicator of the intensity with which the CBO pursues a specific type of activity, such as agricultural production. The regressors are dummy variables for donor sponsoring, government support, and private/other sponsoring. It is common for CBOs to receive funding from multiple sources. Estimation results are reported in Table 12. Each *line* corresponds to a different regression, estimated separately for Burkina Faso and Senegal. As is clear from the results, it is the government sponsored CBOs that focus on agriculture. Donor-sponsored CBOs in contrast are involved in a wide range of economic and social activities, with no clear focus on income-generating activities. The choice of activity cannot therefore explain why in Senegal members of donor-sponsored CBOs have more land on average than members of other CBOs.

Next we create an agricultural activity dummy d_a and we reestimate the regressions shown in Tables 10A and 10B with additional interaction terms $d_a x_i$ between an agricultural focus and other regressors – as we did for donor-sponsoring. Though we should not attach a causal interpretation to coefficients associated with CBO activities – since activities are potentially endogenously determined by CBO members – we can at least test whether earlier results are overturned if we control for CBO activity.

In the first set of regressions, we simply substitute the $d_a x_i$ interaction terms for $d_g x_i$ in the membership regression (26). Results, omitted here to save space, show no significant change in the regressors of interest. We then reestimate the same regression with both $d_a x_i$ and $d_g x_i$ interaction terms. Results, again omitted here to save space, show virtually no change in estimate $d_g x_i$ coefficients and their significance.

We then reestimate the dyadic regressions of Table 11 with $d_a x_i$ interaction terms as well. Again we find no noticeable difference in coefficient estimates and their significance. From this we conclude that whatever the cause for the relationship between donor-sponsoring and elitism in CBO membership, it does not operate through a focus on agricultural production.

8 Conclusion

We have examined the determinants of membership in CBOs in Burkina Faso and Senegal. We have found evidence that, on average, it is the more fortunate members of rural society who belong in CBOs. In Senegal, the dominant criterion is land ownership. In Burkina Faso it is age and family ties with village authorities. Ethnicity also plays a role: CBO membership is less likely for ethnic groups that traditionally emphasize livestock raising.

We looked for evidence of assortative matching along multiple dimensions. To this effect we developed an original methodology based on dyadic regressions. We found robust evidence of positive assorting by physical and ethnic proximity as well as by wealth and household size.

Though our findings are clear, their interpretation is less so. We do not know whether CBO members were richer and more alike than non-CBO members before they joined the CBO, or whether they became so after – and as a result of – joining the CBO. Given the local context, ethnicity, age, land ownership (most of which is inherited), and family ties with village authorities are largely predetermined. Reverse causation is thus unlikely, although it cannot be entirely ruled out.

It is also unclear whether CBO activities benefit primarily if not exclusively their members, or whether the benefits also accrue to non-members in the village. For instance, it is conceivable that CBOs act as local charities, enlisting prosperous members of the community as contributors, with the aim of assisting less fortunate villagers. If this were the case, it would not surprise us to find CBO membership to be elitist. Whether this is the case in the two studied countries is doubtful – in the surveys all CBOs state that they are primarily designed to assist their members. But we need more evidence before drawing final conclusions. These important issues are left for future research.

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Online appendix [for JDE website]: Proof of Proposition 1

Consider the denominator of equation (24) explicitly (recall from equation (25) that it is the sign of *minus* this expression that yields the comparative statics result that we are studying); performing the differentiation yields:

$$\begin{aligned} & \frac{\partial}{\partial y^*}\left[u\left(y^* - t(y^m\left(y^*\right)), t(y^m\left(y^*\right)) + G\right) - u\left(y^*, 0\right)\right] \\ = \; & u_c\left(y^* - t(y^m), t(y^m) + G\right) - u_c\left(y^*, 0\right) \\ & + \frac{dt}{dy^m}\frac{dy^m}{dy^*}\left[\begin{array}{c} u_g\left(y^* - t(y^m), t(y^m) + G\right) \\ -u_c\left(y^* - t(y^m), t(y^m) + G\right) \end{array}\right]. \end{aligned}$$

Now consider the following two first-order Taylor expansions:

$$\begin{aligned} u_c\left(y^* - t(y^m), t(y^m) + G\right) & \approx u_c\left(y^m - t(y^m), t(y^m) + G\right) \\ & \quad + \left(y^* - y^m\right) u_{cc}\left(y^m - t(y^m), t(y^m) + G\right), \\ u_g\left(y^* - t(y^m), t(y^m) + G\right) & \approx u_g\left(y^m - t(y^m), t(y^m) + G\right) \\ & \quad + \left(y^* - y^m\right) u_{cg}\left(y^m - t(y^m), t(y^m) + G\right). \end{aligned}$$

It follows that one can write:

$$\begin{aligned} & u_g\left(y^* - t(y^m), t(y^m) + G\right) - u_c\left(y^* - t(y^m), t(y^m) + G\right) \\ \approx \; & u_g\left(y^m - t(y^m), t(y^m) + G\right) + \left(y^* - y^m\right) u_{cg}\left(y^m - t(y^m), t(y^m) + G\right) \\ & -u_c\left(y^m - t(y^m), t(y^m) + G\right) - \left(y^* - y^m\right) u_{cc}\left(y^m - t(y^m), t(y^m) + G\right), \\ = \; & \underbrace{u_g\left(y^m - t(y^m), t(y^m) + G\right) - u_c\left(y^m - t(y^m), t(y^m) + G\right)}_{=0 \text{ by the FOC that determines } t} \\ & + \left(y^* - y^m\right)\left[u_{cg}\left(y^m - t(y^m), t(y^m) + G\right) - u_{cc}\left(y^m - t(y^m), t(y^m) + G\right)\right]. \end{aligned}$$

Recall also from earlier that:

$$u_c\left(y^* - t(y^m), t(y^m) + G\right) - u_c\left(y^*, 0\right) \approx t(y^m)\left[u_{cg}\left(y^*, 0\right) - u_{cc}\left(y^*, 0\right)\right] + G u_{cg}\left(y^*, 0\right).$$

It follows that we can rewrite the denominator of $\frac{dy^*}{dG}$ as:

$$\begin{aligned} & \frac{\partial}{\partial y^*}\left[u\left(y^* - t(y^m\left(y^*\right)), t(y^m\left(y^*\right)) + G\right) - u\left(y^*, 0\right)\right] \\ = \; & \overbrace{t(y^m)\left[u_{cg}\left(y^*, 0\right) - u_{cc}\left(y^*, 0\right)\right] + G u_{cg}\left(y^*, 0\right)}^{u_c(y^* - t(y^m), t(y^m) + G) - u_c(y^*, 0)} + \frac{dt}{dy^m}\frac{dy^m}{dy^*} \\ & \times \underbrace{\left(y^* - y^m\right)\left[u_{cg}\left(y^m - t(y^m), t(y^m) + G\right) - u_{cc}\left(y^m - t(y^m), t(y^m) + G\right)\right]}_{= u_g(y^* - t(y^m), t(y^m) + G) - u_c(y^* - t(y^m), t(y^m) + G)} \end{aligned}$$

8.1 Case 1. $u_{cg} - u_{cc} > 0$

Consider first Case 1. Then the median member of the group is defined by:

$$1 - F\left(y^*\right) - 2F\left(y^m\right) = 0.$$

It follows that:

$$\frac{dy^m}{dy^*} = -\frac{f(y^*)}{2f(y^m)} < 0$$

When $u_{cg} - u_{cc} > 0$, $\frac{dt(\widehat{y})}{d\widehat{y}} > 0$ so that $\frac{dt}{dy^m} > 0$. Finally, $y^* - y^m < 0$ (since the median member is necessarily located somewhere between the lower bound on group membership y^* and $\overline{y}$). It follows that:

$$\frac{\partial}{\partial y^*}\left[u\left(y^* - t(y^m(y^*)), t(y^m(y^*)) + G\right) - u(y^*, 0)\right]$$

$$= \overbrace{t(y^m)\left[u_{cg}(y^*, 0) - u_{cc}(y^*, 0)\right] + Gu_{cg}(y^*, 0)}^{>0}$$
$$+\overbrace{\frac{dt}{dy^m}}^{>0}\overbrace{\frac{dy^m}{dy^*}}^{<0}\overbrace{\left[(y^* - y^m)\left[\begin{array}{c} u_{cg}(y^m - t(y^m), t(y^m) + G) \\ -u_{cc}(y^m - t(y^m), t(y^m) + G) \end{array}\right]\right]}^{<0} > 0$$

and

$$\frac{dy^*}{dG} < 0.$$

Providing aid to the CBO lowers the limit type y^*, and since group size is given by $1 - F(y^*)$, makes it more inclusive.

8.2 Case 2. $u_{cg} - u_{cc} < 0$

For Case 2, the median member of the group is defined by:

$$F(y^*) - 2F(y^m) = 0,$$

and:

$$\frac{dy^m}{dy^*} = \frac{f(y^*)}{2f(y^m)} > 0.$$

Proceeding in the same manner as for the first case allows one to ascertain that:

$$\frac{\partial}{\partial y^*}\left[u\left(y^* - t(y^m(y^*)), t(y^m(y^*)) + G\right) - u(y^*, 0)\right]$$

$$= \overbrace{t(y^m)\left[u_{cg}(y^*, 0) - u_{cc}(y^*, 0)\right] + Gu_{cg}(y^*, 0)}^{<0}$$
$$+\overbrace{\frac{dt}{dy^m}}^{<0}\overbrace{\frac{dy^m}{dy^*}}^{>0}\overbrace{\left[(y^* - y^m)\left[\begin{array}{c} u_{cg}(y^m - t(y^m), t(y^m) + G) \\ -u_{cc}(y^m - t(y^m), t(y^m) + G) \end{array}\right]\right]}^{<0},$$

where the sign of the last expression in square brackets follows because $y^* - y^m > 0$ in this case (the median group member is necessarily located somewhere below the limit type y^*). Thus, when $u_{cg} - u_{cc} < 0$, the effect on group size of an increase in external resources is ambiguous. Note that if the second term dominates the first, then we will have $\frac{dy^*}{dG} < 0$. Since group size is equal to $F(y^*)$, additional external funding will then make the CBO more exclusive.

8.3 Case 3. $u_{cg} - u_{cc}$ is *inverse* U-shaped in y

For Case 3, the median member of the group is defined by:

$$F(y_H^*) - F(y_L^*) - 2F(y^m) = 0,$$

and

$$\frac{dy^m}{dy_H^*} = \frac{f(y_H^*)}{2f(y^m)} > 0, \frac{dy^m}{dy_L^*} = -\frac{f(y_L^*)}{2f(y^m)} < 0.$$

Consider now the *two* comparative statics expressions (there is one for y_L^* and one for y_H^*). By arguments similar to those above, it is straightforward to establish that:

$$\begin{aligned} & \frac{\partial}{\partial y_L^*}\left[u\left(y_L^* - t(y^m(y_L^*)), t(y^m(y_L^*)) + G\right) - u(y_L^*, 0)\right] \\ = & \overbrace{t(y^m)\left[u_{cg}(y_L^*, 0) - u_{cc}(y_L^*, 0)\right] + G u_{cg}(y_L^*, 0)}^{>0} \\ & + \overbrace{\frac{dt}{dy^m}}^{>0}\overbrace{\frac{dy^m}{dy_L^*}}^{<0}\overbrace{\left[(y_L^* - y^m)\left[\begin{array}{c} u_{cg}(y^m - t(y^m), t(y^m) + G) \\ -u_{cc}(y^m - t(y^m), t(y^m) + G) \end{array}\right]\right]}^{<0} > 0, \end{aligned}$$

where the inequalities in the expression follow because $u_{cg} - u_{cc} > 0$ at y_L^*. Concomitantly:

$$\begin{aligned} & \frac{\partial}{\partial y_H^*}\left[u\left(y_H^* - t(y^m(y_H^*)), t(y^m(y_H^*)) + G\right) - u(y_H^*, 0)\right] \\ = & \overbrace{t(y^m)\left[u_{cg}(y_H^*, 0) - u_{cc}(y_H^*, 0)\right] + G u_{cg}(y_H^*, 0)}^{<0} \\ & + \overbrace{\frac{dt}{dy^m}}^{<0}\overbrace{\frac{dy^m}{dy_H^*}}^{>0}\overbrace{\left[(y_H^* - y^m)\left[\begin{array}{c} u_{cg}(y^m - t(y^m), t(y^m) + G) \\ -u_{cc}(y^m - t(y^m), t(y^m) + G) \end{array}\right]\right]}^{<0}, \end{aligned}$$

whose sign is ambiguous. Thus, while the lower bound y_L^* decreases, rendering the group more inclusive, the effect of donor funding on the upper bound is ambiguous: the overall effect is therefore ambiguous.

8.4 Case 4. $u_{cg} - u_{cc}$ is U-shaped in y

For Case 4, the median member of the group is defined by:

$$F(y_L^*) + 1 - F(y_H^*) - 2F(y^m) = 0,$$

and

$$\frac{dy^m}{dy_H^*} = -\frac{f(y_H^*)}{2f(y^m)} < 0, \frac{dy^m}{dy_L^*} = \frac{f(y_L^*)}{2f(y^m)} > 0.$$

Once more we need to consider two comparative statics expressions. First, for the lower bound:

$$\begin{aligned}
&\frac{\partial}{\partial y_L^*}\left[u\left(y_L^*-t(y^m\left(y_L^*\right)),t(y^m\left(y_L^*\right))+G\right)-u\left(y_L^*,0\right)\right] \\
=\ &\overbrace{t(y^m)\left[u_{cg}\left(y_L^*,0\right)-u_{cc}\left(y_L^*,0\right)\right]+Gu_{cg}\left(y_L^*,0\right)}^{<0} \\
&+\overbrace{\frac{dt}{dy^m}}^{<0}\overbrace{\frac{dy^m}{dy_L^*}}^{>0}\left[\left(y_L^*-y^m\right)\left[\begin{array}{c} u_{cg}\left(y^m-t(y^m),t(y^m)+G\right) \\ -u_{cc}\left(y^m-t(y^m),t(y^m)+G\right)\end{array}\right]\right].
\end{aligned}$$

For the upper bound, on the other hand:

$$\begin{aligned}
&\frac{\partial}{\partial y_H^*}\left[u\left(y_H^*-t(y^m\left(y_H^*\right)),t(y^m\left(y_H^*\right))+G\right)-u\left(y_H^*,0\right)\right] \\
=\ &\overbrace{t(y^m)\left[u_{cg}\left(y_H^*,0\right)-u_{cc}\left(y_H^*,0\right)\right]+Gu_{cg}\left(y_H^*,0\right)}^{>0} \\
&+\overbrace{\frac{dt}{dy^m}}^{>0}\overbrace{\frac{dy^m}{dy_H^*}}^{<0}\left[\left(y_H^*-y^m\right)\left[\begin{array}{c} u_{cg}\left(y^m-t(y^m),t(y^m)+G\right) \\ -u_{cc}\left(y^m-t(y^m),t(y^m)+G\right)\end{array}\right]\right].
\end{aligned}$$

Now consider the location of the median member. If y^m is located amongst the lower y members, $y_L^*-y^m>0$ and $y_H^*-y^m>0$. In this case, we can sign the first comparative statics result as:

$$\begin{aligned}
&\frac{\partial}{\partial y_L^*}\left[u\left(y_L^*-t(y^m\left(y_L^*\right)),t(y^m\left(y_L^*\right))+G\right)-u\left(y_L^*,0\right)\right] \\
=\ &\overbrace{t(y^m)\left[u_{cg}\left(y_L^*,0\right)-u_{cc}\left(y_L^*,0\right)\right]+Gu_{cg}\left(y_L^*,0\right)}^{<0} \\
&+\overbrace{\frac{dt}{dy^m}}^{<0}\overbrace{\frac{dy^m}{dy_L^*}}^{>0}\overbrace{\left[\left(y_L^*-y^m\right)\left[\begin{array}{c} u_{cg}\left(y^m-t(y^m),t(y^m)+G\right) \\ -u_{cc}\left(y^m-t(y^m),t(y^m)+G\right)\end{array}\right]\right]}^{<0},
\end{aligned}$$

which is ambiguous, whereas the second comparative statics result is:

$$\begin{aligned}
&\frac{\partial}{\partial y_H^*}\left[u\left(y_H^*-t(y^m\left(y_H^*\right)),t(y^m\left(y_H^*\right))+G\right)-u\left(y_H^*,0\right)\right] \\
=\ &\overbrace{t(y^m)\left[u_{cg}\left(y_H^*,0\right)-u_{cc}\left(y_H^*,0\right)\right]+Gu_{cg}\left(y_H^*,0\right)}^{>0} \\
&+\overbrace{\frac{dt}{dy^m}}^{>0}\overbrace{\frac{dy^m}{dy_H^*}}^{<0}\overbrace{\left[\left(y_H^*-y^m\right)\left[\begin{array}{c} u_{cg}\left(y^m-t(y^m),t(y^m)+G\right) \\ -u_{cc}\left(y^m-t(y^m),t(y^m)+G\right)\end{array}\right]\right]}^{>0},
\end{aligned}$$

which is also ambiguous. On the other hand, if y^m is located amongst the higher y members, $y_L^* - y^m < 0$ and $y_H^* - y^m < 0$. It follows that:

$$\begin{aligned}
&\frac{\partial}{\partial y_L^*}\left[u\left(y_L^* - t(y^m\left(y_L^*\right)), t(y^m\left(y_L^*\right)) + G\right) - u\left(y_L^*, 0\right)\right] \\
= \; & \overbrace{t(y^m)\left[u_{cg}\left(y_L^*, 0\right) - u_{cc}\left(y_L^*, 0\right)\right] + Gu_{cg}\left(y_L^*, 0\right)}^{<0} \\
& + \overbrace{\frac{dt}{dy^m}}^{<0}\overbrace{\frac{dy^m}{dy_L^*}}^{>0}\overbrace{\left[\left(y_L^* - y^m\right)\left[\begin{array}{c} u_{cg}\left(y^m - t(y^m), t(y^m) + G\right) \\ -u_{cc}\left(y^m - t(y^m), t(y^m) + G\right)\end{array}\right]\right]}^{>0} < 0,
\end{aligned}$$

and

$$\begin{aligned}
&\frac{\partial}{\partial y_H^*}\left[u\left(y_H^* - t(y^m\left(y_H^*\right)), t(y^m\left(y_H^*\right)) + G\right) - u\left(y_H^*, 0\right)\right] \\
= \; & \overbrace{t(y^m)\left[u_{cg}\left(y_H^*, 0\right) - u_{cc}\left(y_H^*, 0\right)\right] + Gu_{cg}\left(y_H^*, 0\right)}^{>0} \\
& + \overbrace{\frac{dt}{dy^m}}^{>0}\overbrace{\frac{dy^m}{dy_H^*}}^{<0}\overbrace{\left[\left(y_H^* - y^m\right)\left[\begin{array}{c} u_{cg}\left(y^m - t(y^m), t(y^m) + G\right) \\ -u_{cc}\left(y^m - t(y^m), t(y^m) + G\right)\end{array}\right]\right]}^{<0} > 0.
\end{aligned}$$

In this case, both $1 - F(y_H^*)$ and $F(y_L^*)$ increase, and therefore external funding renders the group more inclusive.

Table 1. Descriptive statistics	**Burkina Faso**		**Senegal**	
Household characteristics	Mean	St.dev.	Mean	St.dev.
Family ties with authorities (index from 0 to 4)	0.9	1.0	0.8	0.9
Owned land (ha)	3.1	3.7	2.7	3.6
Education level of head (in years)	0.3	1.0	0.7	1.4
Female head dummy	2.4%		7.1%	
Age of head	44	16	50	15
Number of household members	7.5	5.0	9.8	6.0
Share of wifes in household	22%	13%	16%	11%
Share of males>12 in household	13%	16%	20%	16%
Share of females>12 in household	8%	13%	18%	15%
CBO membership				
% which are member of at least one CBO	56.3%		73.8%	
% with at least one male in CBO	47.2%		41.6%	
% with at least one female in CBO	30.2%		64.7%	
Ethnicity (Burkina Faso)				
Mossi	31.7%			
Gourmatche	18.1%			
Fulani	12.3%			
Gourounsi	7.5%			
Twareg	5.6%			
Bissa	4.4%			
Other	20.4%			
Ethnicity (Senegal)				
Wolof			28.0%	
Fulani			24.3%	
Toucouleur			23.5%	
Serere			19.0%	
Other			5.2%	
Number of observations	12212		8415	

Table 2. Village characteristics	**Burkina Faso**		**Senegal**	
	Mean	St.dev.	Mean	St.dev.
Number of households	190	255	115	178
Number of inhabitants	1309	1214	938	1070
Ethnic fractionalization index	0.23	0.24	0.11	0.17
Number of CBOs	3.2	3.7	2.4	2.3
% with at least one CBO	90.7%		78.4%	
Number of wells	4.0	8.3	2.5	3.4
Market in village	28.5%		26.8%	
Electricity in village	2.2%		20.9%	
Village accessible in rainy season	46.6%		64.3%	
Number of observations	268		250	

Table 3. Descriptive statistics on sponsoring and activities

Sponsors:	**Burkina**	**Senegal**
NGO or international donor	32%	44%
Government	25%	15%
Privator sponsor	18%	11%
Activities:		
Average number of activities	2.1	2.1
Collective field	64%	13%
Agriculture	34%	41%
Livestock	13%	9%
Non-farm income	16%	38%
Finance and services	16%	7%
Social and public good provision	21%	19%
Training	12%	14%
Other	14%	28%
Number of groups	727	434

Table 4. Breakdown of household and village characteristics by members and non-members

	Burkina Faso				Senegal			
	mean for:				**mean for:**			
Household characteristics	non-mb.	members	all	t-stat	non-mb.	members	all	t-stat
Log(number of household members)	1.69	1.91	1.83	**-18.21**	1.89	2.18	2.13	**-14.98**
Female head dummy	0.03	0.02	0.02	**5.28**	0.12	0.07	0.08	**5.95**
Age of head	44.12	44.97	44.65	**-2.67**	50.02	51.27	51.08	**-2.61**
Education level of head	0.33	0.34	0.34	-0.15	0.78	0.72	0.73	1.23
Family ties with authorities (index 0 to 4)	0.73	0.93	0.86	**-10.18**	0.64	0.82	0.80	**-6.08**
Log(owned land +1)	1.04	1.26	1.18	**-16.63**	0.81	1.05	1.01	**-9.92**
Village characteristics								
Number of wells	3.76	4.18	4.03	**-2.49**	2.80	2.65	2.67	1.24
Ethnic fractionalization index	0.19	0.24	0.23	**-10.66**	0.15	0.10	0.11	**7.73**
Market in village	0.31	0.29	0.29	**2.22**	0.32	0.30	0.31	1.43
Electricity in village	0.02	0.02	0.02	-0.57	0.33	0.22	0.24	**7.79**
Village accessible in rainy season	0.45	0.49	0.48	**-4.89**	0.76	0.63	0.65	**8.05**
Number of households	199	169	181	**6.60**	146	124	127	**3.57**
Number of inhabitants	1395	1296	1333	**4.08**	1173	1004	1029	**4.62**
Number of CBOs	3.34	3.72	3.57	**-5.19**	2.92	2.71	2.75	**2.87**
Log(# CBOs/# village inhabitants)	-6.06	-5.84	-5.92	**-13.73**	-5.88	-5.72	-5.75	**-6.28**
Log(average household size)	2.09	2.19	2.15	**-9.23**	2.15	2.21	2.20	**-4.76**
Log(number of RPOs in village)	0.89	1.00	0.96	**-7.37**	0.84	0.77	0.78	**3.08**
Number of observations	4132	6879	11011		1090	6209	7299	

Using only households in villages with at least one CBO.

Table 5A. CBO membership regressions -- Burkina Faso

	Any hh member		Male hh member		Female hh member	
		robust		robust		robust
	coef	z-stat.	coef	z-stat.	coef	z-stat.
Household characteristics						
Distance to village center	-0.053***	-3.250	-0.050***	-2.980	-0.037**	-2.236
Family ties with authorities (index 0 to 4)	0.265***	4.099	0.227***	3.441	0.264***	3.511
Log(owned land +1)	0.339***	4.323	0.288***	3.421	0.046	0.489
Education level of head	-0.007	-0.228	0.001	0.046	-0.061*	-1.885
Female head dummy	-0.041	-0.159	-0.424	-1.519	-0.589***	-2.582
Age of head	-0.013***	-5.388	-0.016***	-7.144	-0.002	-1.067
Log(number of household members)	0.628***	7.445	0.490***	5.991	0.545***	6.905
Share of wifes in household	1.228***	4.658	0.913***	3.159	1.129***	3.589
Share of males>12 in household	0.903***	4.061	0.691***	2.996	0.379	1.440
Share of females>12 in household	1.242***	4.582	0.685**	2.551	1.038***	3.095
Ethnicity (Mossi is omitted category)						
Gourmatche	-0.999***	-4.899	-0.832***	-3.697	-0.814***	-3.514
Fulani	-0.835***	-3.370	-0.532**	-2.090	-0.485	-1.516
Gourounsi	-0.025	-0.100	-0.725**	-2.307	0.470*	1.865
Twareg	0.067	0.244	0.389	1.409	-1.223***	-2.825
Bissa	-2.926***	-4.195	-2.899***	-5.274	-1.744***	-2.600
Other	-0.280	-1.189	-0.166	-0.759	-0.246	-1.077
Village characteristics						
Number of wells	0.014*	1.667	0.012	1.518	0.010	1.367
Ethnic fractionalization index	1.262***	3.858	1.073***	3.075	0.285	0.675
Market in village	-0.051	-0.286	-0.075	-0.400	-0.084	-0.393
Electricity in village	-0.914	-1.537	-0.733	-1.089	-1.265***	-2.669
Village accessible in rainy season	0.117	0.782	0.122	0.736	0.293	1.628
Log(#CBOs/#village inhabitants)	0.350***	3.518	0.353***	3.608	0.275**	2.065
Log(average household size)	0.460***	3.627	0.407***	3.190	0.169	1.162
Log(number of CBOs in village)	-0.016	-0.111	0.092	0.581	-0.063	-0.429
Intercept	0.395	0.614	0.566	0.827	-0.603	-0.682
Number of observations	10,534		10,534		10,534	
Number of villages	241		241		241	

note: *** p<0.01, ** p<0.05, * p<0.1

all z stat. based on robust standard errors corrected for village clustering

Table 5B. CBO membership regressions -- Senegal

	Any hh member		Male hh member		Female hh member	
	coef	robust z-stat.	coef	robust z-stat.	coef	robust z-stat.
Household characteristics						
Distance to village center	-0.006	-0.468	-0.009	-0.788	0.002	0.192
Family ties with authorities (index 0 to 4)	0.124	1.088	0.022	0.230	0.057	0.718
Log(owned land +1)	0.392***	2.829	0.221	1.501	0.336***	2.876
Education level of head	-0.002	-0.047	-0.045	-1.395	0.008	0.263
Female head dummy	0.037	0.158	0.404	1.509	-0.760***	-4.289
Age of head	-0.002	-0.495	-0.008**	-2.425	0.005	1.542
Log(number of household members)	0.799***	5.788	0.089	0.914	0.685***	6.120
Share of wifes in household	0.843	1.447	-0.715	-1.233	1.264**	2.386
Share of males>12 in household	0.429	1.398	0.109	0.365	-0.347	-1.289
Share of females>12 in household	0.112	0.274	-0.447	-1.289	0.539	1.420
Ethnicity (Wolof is omitted category)						
Fulani	-0.649	-1.630	-0.904**	-2.576	-0.563*	-1.716
Toucouleur	1.279***	2.630	0.651*	1.714	0.342	1.000
Serere	-1.130***	-2.807	-1.527***	-4.164	-1.031***	-3.363
Other	-0.423	-1.099	-0.060	-0.139	-0.187	-0.668
Village characteristics						
Number of wells	0.027	0.675	0.045	1.443	0.003	0.106
Ethnic fractionalization index	-1.181	-1.454	-0.087	-0.111	-1.987***	-2.698
Market in village	-0.201	-0.502	-0.185	-0.600	-0.233	-0.789
Electricity in village	-0.039	-0.085	0.425	1.146	-0.136	-0.403
Village accessible in rainy season	-0.452	-1.182	-0.335	-0.997	-0.350	-1.145
Log(#CBOs/#village inhabitants)	0.418	1.463	0.375*	1.898	0.196	0.930
Log(average household size)	0.237	0.770	0.221	0.705	0.425	1.526
Log(number of CBOs in village)	-0.576**	-2.382	0.539**	2.162	-0.439**	-2.135
Intercept	2.710	1.597	1.783	1.377	0.308	0.256
Number of observations	6,991		6,991		6,991	
Number of villages	196		196		196	

note: *** p<0.01, ** p<0.05, * p<0.1

All z-stat based on standard errors corrected for village clustering.

Table 6. CBO membership regressions with village fixed effects

	Burkina Faso		Senegal	
	Any hh member		Any hh member	
	coef	robust z-stat.	coef	robust z-stat.
Household characteristics				
Distance to village center	-0.047***	-5.766	0.005	0.452
Family ties with authorities (index 0 to 4)	0.415***	10.837	0.152**	2.354
Log(owned land +1)	0.278***	5.301	0.556***	5.539
Education level of head	-0.011	-0.424	0.038	1.247
Female head dummy	-0.262	-1.366	0.511**	2.490
Age of head	-0.011***	-6.102	-0.002	-0.665
Log(number of household members)	0.917***	15.629	1.143***	10.859
Share of wifes in household	1.547***	6.176	1.019**	1.965
Share of males>12 in household	0.366*	1.895	0.038	0.118
Share of females>12 in household	0.350	1.453	0.397	1.159
Ethnicity (*)				
Gourmatche	0.688**	2.273		
Fulani	-1.271***	-7.009	-1.014***	-3.578
Gourounsi	0.530	1.437		
Twareg	-1.352***	-4.043		
Bissa	1.174	1.585		
Other	-0.026	-0.149		
Toucouleur			-0.622	-1.397
Serere			0.202	0.519
Other			-0.743**	-2.451
Number of observations	9,620		4,346	
Number of villages	212		109	
Minimum obs per village	10		9	
Average obs per village	47		43	
Maximum obs. per village	264		111	

note: *** p<0.01, ** p<0.05, * p<0.1

All z-stat based on standard errors corrected for village clustering.

Table 7. Marginal effects for Table 6

		Burkina	Senegal
Average probability of group membership		86.5%	95.2%
Household characteristics	dummy	dPr/dx	dPr/dx
Distance to village center	no	-2.2%	0.1%
Family ties with authorities (index 0 to 4)	no	4.8%	0.6%
Log(owned land +1)	no	2.2%	1.8%
Education level of head	no	-0.1%	0.3%
Female head dummy	yes	-3.3%	1.9%
Age of head	no	-2.1%	-0.2%
Log(number of household members)	no	6.6%	3.1%
Share of wifes in household	no	2.3%	0.5%
Share of males>12 in household	no	0.7%	0.0%
Share of females>12 in household	no	0.5%	0.3%
Ethnicity (*)			
Gourmatche	yes	6.9%	
Fulani	yes	-20.6%	-6.1%
Gourounsi	yes	5.3%	
Twareg	yes	-23.3%	
Bissa	yes	9.0%	
Other	yes	-0.3%	
Toucouleur	yes		-3.5%
Serere	yes		0.9%
Other	yes		-4.6%

The reported marginal effects corresponds to the coefficients reported in Tables 6A and 6B.
For dummy variables the table shows the change in probability of group membership with a change in the variable from 0 to 1. For the other variables the table shows the change in probability associated with an increase in value of one standard deviation.
(*) Mossi is omitted category in Bukina Faso. Wolof is omitted category in Senegal.

Table 8. Descriptive statistics on paired data

	Burkina Faso		Senegal	
CBO membership	Mean	St.dev.	Mean	St.dev.
% households in same CBO	29.8%		67.6%	
% with at least one male in same CBO	22.4%		32.5%	
% with at least one female in same CBO	13.0%		54.7%	
Distance				
Physical distance	9.37	6.54	9.37	8.02
Same ethnicity dummy	0.86	0.34	0.90	0.30
Absolute difference in household characteristics				
Log(number of household members)	0.63	0.50	0.58	0.48
Female head dummy	0.04	0.20	0.14	0.34
Age of head	17.02	13.44	15.49	12.01
Education level of head	0.57	1.24	0.97	1.73
Family ties with authorities (index 0 to 4)	0.56	0.81	0.59	0.83
Log(owned land +1)	0.52	0.57	0.42	0.49
Sum of household characteristics				
Log(number of household members)	3.63	0.92	4.28	0.91
Female head dummy	0.04	0.21	0.17	0.41
Age of head	88.51	23.36	101.51	21.46
Education level of head	0.68	1.44	1.53	2.19
Family ties with authorities (index 0 to 4)	1.52	1.63	1.59	1.47
Log(owned land +1)	2.25	1.04	1.94	1.23
Number of pairs	349453		179735	

Table 9A. Dyadic regressions -- Burkina Faso

	Any hh member		Male hh members		Female hh members	
		robust		robust		robust
	Coef.	z stat.	Coef.	z stat.	Coef.	z stat.
Physical distance	-0.006***	-4.910	-0.004***	-3.787	-0.002***	-4.426
Same ethnicity dummy	0.204***	4.740	0.140***	4.967	0.057***	2.738
Absolute difference in household characteristics						
Distance from village center	0.000	0.073	0.001	0.675	-0.000	-0.342
Family ties with authorities (index 0 to 4)	-0.057*	-2.097	-0.031	-2.494	-0.026**	-1.762
Log(owned land +1)	0.000	0.023	0.001	0.216	0.002	0.369
Education level of head	-0.005	-1.544	-0.003	-1.157	-0.001	-0.829
Female head dummy	-0.076	-2.220	-0.115***	-3.120	-0.008	-0.621
Age of head	-0.000**	-2.097	-0.000*	-1.887	-0.000***	-1.830
Household size and composition	Yes		Yes		Yes	
Sum of household characteristics						
Distance from village center	-0.000	-0.198	-0.000	-0.077	-0.000	-0.294
Family ties with authorities (index 0 to 4)	0.065***	2.908	0.039***	3.582	0.025***	2.156
Log(owned land +1)	0.023***	2.929	0.016***	2.871	0.006**	1.416
Education level of head	0.004	0.977	0.002	0.579	0.001	0.896
Female head dummy	-0.071*	-1.248	-0.061*	-1.011	-0.021*	-0.966
Age of head	-0.001***	-2.887	-0.001***	-3.178	-0.000	-1.150
Household size and composition	Yes		Yes		Yes	
Village fixed effects	Yes		Yes		Yes	
Intercept	-0.155**	-2.403	-0.061	-1.363	-0.103***	-2.624
Number of observations	319,499		319,499		319,499	

Note: *** p<0.01, ** p<0.05, * p<0.1. Z-stat corrected for village clustering.

Table 9B. Dyadic regressions -- Senegal

	Any hh member		Male hh members		Female hh members	
		robust		**robust**		**robust**
	Coef.	**z stat.**	**Coef.**	**z stat.**	**Coef.**	**z stat.**
Physical distance	-0.005**	-2.327	-0.001	-1.369	-0.004**	-2.457
Same ethnicity dummy	0.109**	2.230	0.066**	2.494	0.064**	2.193
Absolute difference in household characteristics						
Distance from village center	0.004**	1.987	0.000	0.247	0.003*	1.762
Family ties with authorities (index 0 to 4)	-0.004	-0.613	-0.002	-0.495	-0.000	-0.000
Log(owned land +1)	-0.054***	-3.165	-0.025**	-2.538	-0.024**	-2.233
Education level of head	-0.010**	-2.316	-0.006**	-2.537	-0.007**	-2.067
Female head dummy	-0.048**	-2.237	-0.183***	-3.679	-0.070***	-3.578
Age of head	-0.000	-1.041	-0.000	-0.639	0.000	0.775
Household size and composition	Yes		Yes		Yes	
Sum of household characteristics						
Distance from village center	0.001	0.779	0.001	1.522	0.001	0.897
Family ties with authorities (index 0 to 4)	0.006	0.621	0.000	0.017	0.004	0.701
Log(owned land +1)	0.058***	2.809	0.031***	2.647	0.028**	2.316
Education level of head	0.002	0.622	0.001	0.471	0.002	0.511
Female head dummy	0.018	0.713	0.084*	1.780	-0.032	-0.963
Age of head	-0.001*	-1.951	-0.001***	-3.046	0.000	0.235
Household size and composition	Yes		Yes		Yes	
Village fixed effects	Yes		Yes		Yes	
Intercept	0.416***	3.996	0.222***	4.022	0.092	1.228
Number of observations	167,017		167,017		167,017	

Note: *** p<0.01, ** p<0.05, * p<0.1. Z-stat corrected for village clustering.

Table 10. CBO membership and donor-sponsoring

	Burkina Faso		Senegal	
		robust		robust
Household characteristics	**Coef.**	**z stat.**	**Coef.**	**z stat.**
Distance to village center	-0.023***	-3.612	0.006	0.908
Family ties with authorities (index 0 to 4)	0.154***	5.488	0.132***	2.743
Log(owned land +1)	0.124***	3.243	0.327***	4.061
Education level of head	0.005	0.271	0.026	1.133
Female head dummy	-0.473***	-2.658	-0.378**	-2.404
Age of head	-0.010***	-6.663	-0.003	-1.206
Household size and composition	Yes		Yes	
Ethnicity (*)				
Gourmatche	0.045	0.213		
Fulani	-1.098***	-8.063	-0.677***	-3.490
Gourounsi	0.438	1.596		
Twareg	-1.507***	-4.833		
Other	-0.300***	-2.693		
Toucouleur			-0.368	-1.268
Serere			-0.476	-1.557
Other			-0.802***	-3.507
Donor-sponsoring interacted with:				
Household characteristics				
Distance to village center	-0.024**	-2.046	-0.001	-0.102
Family ties with authorities (index 0 to 4)	0.309***	5.707	-0.094	-1.452
Log(owned land +1)	0.052	0.684	0.137	1.206
Education level of head	-0.011	-0.313	-0.056	-1.644
Female head dummy	-0.042	-0.139	0.652***	2.863
Age of head	0.007**	2.461	0.002	0.475
Household size and composition	Yes		Yes	
Ethnicity (*)				
Gourmatche	15.626	0.044		
Fulani	0.857***	2.926	0.325	1.067
Gourounsi	1.064*	1.903		
Twareg	-1.019	-1.190		
Other	1.485***	4.289		
Toucouleur			-0.135	-0.313
Serere			0.284	0.615
Other			0.565	1.587
Group fixed effects	Yes			
Number of observations	25,656		12,850	
Number of groups	551		298	

note: significance level .01 - ***; .05 - **; .1 - *. Z-stat corrected for village clustering.

(*) Mossi is omitted category in Bukina Faso. Wolof is omitted category in Senegal.

Table 11. Dyadic regressions comparing donor-sponsored CBOs with others

	Burkina Faso				Senegal			
	donor-sponsored		non-donor-sp.		donor-sponsored		non-donor-sp.	
		robust		robust		robust		robust
Distance	**Coef.**	**z stat.**	**Coef.**	**z stat.**	**Coef.**	**z stat.**	**Coef.**	**z stat.**
Physical distance	-0.040***	-5.126	-0.043***	-4.496	-0.042**	-2.113	-0.015	-1.228
Same ethnicity dummy	1.508***	2.803	1.168***	5.155	0.254	1.124	0.532**	1.967
Absolute difference in household characteristics								
Distance from village center	0.004	0.223	-0.009	-0.847	0.022*	1.687	0.012	0.758
Family ties with authorities	-0.280**	-2.392	-0.180*	-1.889	0.016	0.456	-0.085	-1.494
Log(owned land +1)	-0.149**	-1.988	0.034	0.739	-0.192*	-1.750	-0.326***	-3.092
Education level of head	0.014	0.304	-0.045***	-2.646	-0.056	-1.477	-0.039	-1.215
Female head dummy	-0.087	-0.522	-1.094**	-2.039	-0.030	-0.362	-0.218	-1.252
Age of head	-0.001	-0.418	-0.005***	-3.119	-0.004*	-1.694	0.003	1.311
Household size and composition	Yes		Yes		Yes		Yes	
Sum of household characteristics								
Distance from village center	-0.020	-0.956	0.004	0.334	0.009	0.766	0.012	1.202
Family ties with authorities	0.461***	3.289	0.214***	2.697	-0.001	-0.025	0.143***	2.663
Log(owned land +1)	0.155*	1.958	0.113**	2.456	0.271**	2.500	0.281***	2.881
Education level of head	-0.010	-0.184	0.019	0.765	-0.002	-0.054	0.028	0.736
Female head dummy	-0.271	-1.020	-0.528	-0.889	0.392***	3.534	-0.008	-0.030
Age of head	-0.003	-1.059	-0.007***	-3.288	0.000	0.185	-0.005**	-2.167
Household size and composition	Yes		Yes		Yes		Yes	
Village fixed effects	Yes		Yes		Yes		Yes	
Number of observations	173,247		234,586		99,328		103,327	

Note: significance level .01 - ***; .05 - **; .1 - *. Z-stat corrected for village clustering.

Table 12. Sponsoring and activity

	Burkina						Senegal					
Sponsored by:	**Donor**		**Government**		**Private sources**		**Donor**		**Government**		**Private sources**	
Activity (dependent variable):	**Coef.**	**t-stat.**	**Coef.**	**t-stat.**	**Coef.**	**t-stat.**	**Coef.**	**t-stat.**	**Coef.**	**t-stat.**	**Coef.**	**t-stat.**
Collective field	**0.118**	2.06	-0.048	-0.6	**-0.277**	-2.31	0.170	1.36	-0.029	-0.1	-0.481	-1.03
Agriculture	**0.271**	4.12	**0.545**	6.98	**0.360**	3.17	**0.186**	2.76	**0.432**	3.46	0.168	1.04
Livestock	**0.364**	3.54	0.143	0.88	**0.533**	3.09	-0.098	-0.51	0.426	1.55	0.210	0.64
Non-farm income	**0.289**	2.96	-0.008	-0.05	-0.085	-0.41	**0.213**	3.22	-0.140	-0.79	**0.467**	3.89
Finance and services	0.098	0.88	-0.089	-0.56	0.102	0.52	-0.067	-0.32	-1.606	-1.63	0.011	0.03
Social and public good provision	**0.427**	5.43	0.034	0.26	-0.187	-1.03	0.085	0.71	-0.199	-0.7	-0.064	-0.22
Training	**0.486**	4.73	0.141	0.85	0.182	0.87	**0.455**	4.71	0.114	0.43	-0.122	-0.33
Other	**0.209**	1.84	-0.176	-0.99	-0.130	-0.56	0.050	0.55	**-0.616**	-2.26	-0.014	-0.07
Number of observations	727						434					

Results from negative binomial regressions of the number of activities in various categories on the number of different types of sponsors.