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Aid, peasants and social exclusion

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Jean-Louis Arcand
Graduate Institute of International Studies
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Aid, peasants and social exclusion

J.-L.Arcand[*,a], N.Wagner[a]

[a] *International Economics Section. The Graduate Institute of International and Development Studies, Avenue de la Paix 11A, 1202 Genève, Switzerland*

Abstract

Using unique village census data collected in 2003 and 2008 in Senegal, we assess the impact of a major World Bank-funded Community Driven Development (CDD) program on membership and assortative matching in community-based organizations (CBOs). We implement both standard discrete choice and dyadic regression techniques. We find that channeling development aid through CBOs makes these organizations more inclusive in the sense that a number of tradition-bound assortative matching patterns are partly broken. Ceteris paribus, this leads to more heterogeneous CBOs. On the other hand, the likelihood of CBO membership is reduced in treated villages, with significant differences between men and women. Our results suggest that grassroots level development projects which target CBOs must be carefully designed and executed if they are not to result, paradoxically, in a greater degree of social exclusion, with differentiation by gender playing a crucial role.

Key words: Community Based Organizations, Dyadic Regression, Gender Differences, Social Exclusion
JEL classification: C21, D71

Highlights

- We analyze the impact of a CDD program using panel village census data from Senegal.
- We consider changes in household membership in CBOs due to treatment by the program.
- Tradition-bound matching is partly broken, leading to more socially diverse CBOs.
- Yet, the likelihood of a household belonging to a CBO is reduced in treated villages.
- Significant gender differences imply particular care in designing such programs.

1. Introduction

The latest estimates released by the UN Food and Agricultural Organization project more than a billion people suffering from malnourishment and hunger worldwide in 2009. This calls for action. Past responses to such reports have involved large-scale development initiatives whose success, on most counts, has been extremely limited. Concomitantly, development programs designed to build capacity amongst community-based organizations (CBOs) have experienced a revival in recent years due to the repeated failure of large top-down initiatives.

[*]Corresponding Author. Tel.: + 41 22 908 59 45; fax: + 41 22 733 30 49.
Email addresses: `jean-louis.arcand@graduateinstitute.ch` (J.-L.Arcand), `natascha.wagner@graduateinstitute.ch` (N.Wagner)

The renewed interest in community driven development (CDD) was triggered by the first World Social Forum in Porto Alegre, Brazil, in 2001. CDD programs are demand-driven, built on local structures, and are decentralized by design. As a consequence of their participatory nature, CDD programs include villagers in the decision-making and implementation processes. Currently, the World Bank has, by their own account, an annual CDD budget of approximately $ 2 billion (Mansuri and Rao, 2004). CDD has also spawned many imitators in bilateral aid agencies, thereby ensuring that participatory approaches to development are far from being a marginal phenomenon. The conditions for the successful implementation of CDD programs in West Africa are a priori favorable, given that many households participate in CBOs, ranging from rural producer associations to gender-based social clubs. These peasant organizations are actively involved in transmitting development aid and social programs to poor rural households. In particular, our Senegalese village census data, collected in 2003 and 2008, show that most villages have at least one and many villages have several CBOs. We exploit the panel structure of our dataset to answer a simple yet important question: Are CBOs an effective conduit through which to deliver development aid?

Arcand and Fafchamps (2008) examine the household characteristics associated with membership in CBOs. They present evidence that on average the more fortunate members of rural society belong to CBOs. In their cross-sectional results for Senegal they find that land ownership is an important criterion for CBO membership and that individuals assortatively match by physical and ethnic proximity, wealth, and household size. The analysis at hand builds on Arcand and Fafchamps' and extends it further by exploiting the panel nature of our dataset. The dyadic regression framework introduced by Fafchamps and Gubert (2007) is extended to a difference in differences setting. We aim at assessing the impact on CBO formation of the *Programme de Services Agricoles et Organisations de Producteurs* (PSAOP), a national CDD agricultural program in Senegal, funded by the World Bank. To the best of our knowledge this is the first paper that quantitatively analyzes the responsiveness of CBOs to development aid.

In social terms our research question translates into asking whether CBOs that are treated by the program become more inclusive or more exclusive as a result. This allows us to provide an answer to one of the main criticisms of CDD programs: While the participatory CBO-based approach is often praised as an effective poverty reduction tool, CBOs are frequently blamed for generating elite capture and social exclusion at the grassroots level (Platteau and Gaspart, 2003). While the elite capture argument is compelling in theory, aggregate measures of inequality and social polarization for the Senegalese villages we consider indicate that both decrease at a faster rate for villages treated by the program. In addition, dyadic regression results suggest that homophily is reduced by the intervention. Moreover, we find that CBOs in treated villages become more inclusive in that poorer members of the community who live at the periphery of the village and were less likely to be members of a CBO before the implementation of the project are more likely to become members after treatment. On the other hand, we find a negative impact of treatment by the program on participation in CBOs in general, with significant differences between males and females.

While much has been written about CBOs, the literature in question is essentially non-academic, with the operational issues considered varying from capacity building to CBO effectiveness. Krishna (2003) presents an analytical framework geared towards identifying an optimal allocation of responsabilities between local governments and CBOs. She argues that governments as well as CBOs profit from partnerships. Another important role for CBOs is seen in the health sector, especially in the fight against HIV/AIDS. While Stevenson and White (1994) describe the obstacles that are faced by CBOs that engage in HIV/AIDS prevention, Arcand et al. (2011) present evidence that effective HIV/AIDS sensitization campaigns can be run through CBOs. Given that international donors have become increasingly aware of CBOs, there is a growing need to evaluate their activities, as argued by Carman (2007). Yet, none of these studies looks inside CBOs and analyzes the factors that determine their composition. The potential transformation of CBOs due to development cooperations is not considered, either. This is exactly the focus of the current analysis.

The remainder of the paper is structured as follows. Section 2 introduces the Senegal PSAOP program. In section 3 we present a simple theoretical model that allows us to frame our research question in the context of endogenous group formation and characterizes the conditions under which CBOS that receive aid will be more (or less) inclusive than CBOs that do not. Section 4 describes our empirical strategy, which is based on the one hand on membership regressions and, on the other, on a dyadic regression framework. In section 5 we describe our data and present our results. Section 6 concludes.

2. Context

Community based organizations (CBOs) are a pervasive aspect of rural life in francophone West Africa. These organizations are created by peasants so as to render services to the members of the group. CBOs play an important role in the daily lives of peasants because of the manifold activities they are involved in and the manner in which they extend a peasant's social network beyond the family. Senegalese CBOs have been in existence since the pre-independence period (Ba et al., 2002 or Faye and Ndiaye, 1998). Numerous national confederations of CBOs exist and have substantial political influence. In 2008 68 % of the households in our sample had at least one household member participating in a CBO and 59 % of the households had a household head or a spouse who belonged to at least one CBO.

Arcand (2004) and DeJanvry and Sadoulet (2004) have classified CBO activities into five broad classes: (i) Assistance to income-generating activities such as petty commerce, irrigated agriculture, and the production of garden vegetables; (ii) Management of common property resources such as forests, grazing land, water, and fish stocks; (iii) Provision of social cohesion, redistribution, or insurance such as cereal banks, collective fields, and tontines (Rotating Savings and Credit Associations); (iv) Support with training and information dissemination; and (v) engaging in external representation within local development committees or higher level confederations of CBOs. Thus, CBOs manage common resources, administer public goods, function as credit and savings associations, exercise political power and are building blocks for social cohesion and exchange.

The definition of a CBO adopted here corresponds to the term *groupement* commonly used by the villagers. CBOs may also carry out activities that benefit the village as a whole in which case benefits are not restricted to members. In what follows, we do not differentiate between the various activities CBOs might carry out. Instead, we consider CBO membership in general. The focus on membership alone allows us to contrast participants with non-participants and to pin down characteristics associated with membership. In particular, we study how a village's receiving aid changes the impact of various variables on the probability of membership.

Studying the socioeconomic composition of CBOs is important because CDD programs can use these existing structures to (i) empower communities, (ii) improve accountability, and (iii) build capacity (Binswanger and

Nguyen (2007)). The Senegalese *Programme de Services Agricoles et Organisations de Producteurs* (PSAOP) takes advantage of local CBOs to reach the rural poor. The program started in May 2000 and is a three-phase rural development program co-financed by the World Bank. The objectives of the PSAOP are to:

- Reinforce the capacity of CBOs as a means of reaching the rural poor;
- Increase agricultural productivity through the adoption of new agricultural technologies, in particular through the activities of "agricultural advisors" and by financing applied agricultural research/adoption at the village level;
- Improve household welfare, with a particular emphasis on food security.

The first phase of the program (PSAOP I) was implemented from May 2000 to 2006. Registered CBOs were able to request funding for a menu of eligible projects, including literacy training, agricultural extension and small-scale rural infrastructure such as wells. The PSAOP provides a unique opportunity to evaluate the effect of a CDD program on the determinants of CBO membership, as well as its impact on social structure at the village level.

3. A model of endogenous democratic group formation

To better motivate our empirical analysis, we begin by presenting 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 that can help guide the empirical analysis.

3.1. Basic setup

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

$$V(c, g, N) = c + yu\,(g, N) = y - t + yu\,(tN + G, N)\,, \tag{1}$$

where t represents a membership fee, G is external financial resources, and $tN + G$ is therefore the total budget of the CBO. Variable y denotes any aggregate that raises utility, is expressed in money metric terms, and affects the marginal utility of the club good. In much of what follows, y is taken to be income or wealth, but this is not crucial. Variable y is assumed to be distributed in the village over the interval $[\underline{y}, \overline{y}]$ according to the pdf $f(y)$, with associated cdf $F(y)$: without loss of generality we are therefore normalizing village population to 1.

We assume that $u_g > 0, u_{gg} \leqslant 0$. The effect of group size N on welfare depends, among other things, on economies of scale in the provision of the club good and on congestion effects. As such, we remain agnostic as to the signs of u_N and u_{NN}. We also remain agnostic concerning the signs of the second cross-partial derivative u_{gN}.

An important special case of the preferences given by (1) is a situation in which returns to scale in the provision of the public good are constant:

$$V(c, g, N) = y - t + yu\left(\frac{tN + G}{N}\right). \tag{2}$$

In the absence of outside funding ($G = 0$), (2) boils down to:

$$V(c, g, N) = y - t + yu\,(t)\,.$$

In what follows, we shall show that one of the key elements in determining the effect of outside funding on endogenous group size is indeed whether $u(.)$ displays constant returns.

Consider a prospective CBO member with income $\widehat{y}$. The optimal choice of t by individual $\widehat{y}$, which we shall denote by $t(\widehat{y}, N, G)$ is defined by the first-order condition (FOC):

$$\frac{\partial u}{\partial t} = -1 + \widehat{y} N u_g \left(tN + G, N\right) = 0. \tag{3}$$

The second-order condition (SOC), which we assume to be satisfied, is given by

$$\widehat{y} N u_{gg} \left(tN + G, N\right) < 0.$$

By the Implicit Function Theorem, the following three comparative statics results are then immediate:

$$\frac{dt(\widehat{y}, N, G)}{d\widehat{y}} = -\frac{N u_g \left(t(\widehat{y}, N, G)N + G, N\right)}{\widehat{y} N u_{gg} \left(t(\widehat{y}, N, G)N + G, N\right)}, \tag{4}$$

$$\frac{dt(\widehat{y}, N, G)}{dN} = -\frac{1}{N^2}\left(\begin{array}{c} Nt(\widehat{y}, N, G) \\ + \frac{u_g\left(t(\widehat{y},N,G)N+G,N\right)+N u_{gN}\left(t(\widehat{y},N,G)N+G,N\right)}{u_{gg}\left(t(\widehat{y},N,G)N+G,N\right)} \end{array} \right), \tag{5}$$

$$\frac{dt(\widehat{y}, N, G)}{dG} = -\frac{1}{N}. \tag{6}$$

Assuming free entry and exit from the CBO, a villager with income y will join the CBO whenever the gain from joining, $\Phi(\widehat{y}, y)$, is positive, i.e., if:

$$\begin{aligned} \Phi(\widehat{y}, y) &\equiv y - t(\widehat{y}, N, G) + yu\left(t(\widehat{y}, N, G)N + G, N\right) - y - yu\left(0, 0\right) \\ &= -t(\widehat{y}, N, G) + yu\left(t(\widehat{y}, N, G)N + G, N\right) \geqslant 0, \end{aligned} \tag{7}$$

where the second equality follows from setting $u\left(0, 0\right) = 0$. Below, we will appeal to the Median Voter Theorem to set $\widehat{y}$.

3.2. Equilibrium group size

The limit type y^* of those who wish to join the group is implicitly defined by:

$$\Phi(\widehat{y}, y^*) = -t(\widehat{y}, N, G) + y^* u\left(t(\widehat{y}, N, G)N + G, N\right) = 0. \tag{8}$$

Note that the equation given by (7), since it is increasing in y ($\frac{\partial \Phi(\widehat{y}, y)}{\partial y} = u\left(t(\widehat{y}, N, G)N + G, N\right) \geqslant 0$), implies that the group is made up of individuals with relatively high y, with group membership being constituted by individuals who belong to the interval $[y^*, \overline{y}]$.

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 optimal transfer is then given by $t(\widehat{y}, N, G) = t(y^m, N, G)$. Given the choice of t by the median group member, the limit type y^* is then obtained by solving expression (8) where $\widehat{y}$ is replaced with y^m: The limit value y^* is therefore implicitly defined by:

$$\Phi(y^m, y^*) = -t(y^m, N, G) + y^* u\left(t(y^m, N, G)N + G, N\right) = 0. \tag{9}$$

Now group size is related to the limit type by the relationship:

$$N = 1 - F\left(y^*\right),$$

whereas the median group member is defined by:

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

Combining these two equations then allows one to write:

$$y^* = F^{-1}(1-N), \;\; y^m = F^{-1}\left(\frac{N}{2}\right).$$

We can then plug these last two expressions back into equation (9) so as to obtain an implicit characterization of equilibrium group size:

$$-t\left(F^{-1}\left(\frac{N}{2}\right), N, G\right) + F^{-1}(1-N)u\left(t\left(F^{-1}\left(\frac{N}{2}\right), N, G\right)N + G, N\right) = 0. \tag{10}$$

3.3. The impact of external assistance on equilibrium group size

What is the effect of external assistance G on equilibrium group size N? Applying the Implicit Function Theorem to equation(10) followed by some manipulations allows one to establish the following Proposition:

Proposition 1. *(i) The comparative statics of equilibrium group size with respect to external assistance is given by:*

$$\frac{dN}{dG} = \frac{1}{\left[\frac{N}{y^* f(y^*)} - 1\right]t - Ny^*u_N + \frac{[y^*-y^m][N+2y^m f(y^m)(1+N^2y^m u_{gN})]}{2N^2[y^m]^3 f(y^m)u_{gg}}}. \tag{11}$$

whose sign is ambiguous. (ii) In the case in which the benefits to group membership display constant returns ($u(tN+G, N) = u\left(\frac{tN+G}{N}\right)$), equilibrium groups size is always increasing in external assistance, with:

$$\frac{dN}{dG} = \frac{1}{\frac{Nt}{y^* f(y^*)} + \frac{G}{N} + \frac{[y^*-y^m]N}{2[y^m]^3 f(y^m)u''}} > 0. \tag{12}$$

Proof. See Appendix. □

Proposition 1 (i) establishes the ambiguity of the comparative statics of equilibrium group size with respect to external assistance in the general case. To see why, consider the denominator of the expression given in (11). Notice that $y^* - y^m < 0$ since the median group member always has a higher y than the limit type, and that the denominator in the third part of the expression is negative since it corresponds to a positive quantity multiplied by the SOC, which is assumed to hold and is therefore negative.

In the case of constant returns to group benefits, as shown by Proposition 1 (ii), the comparative statics are unambiguous: additional external funding will *always* increase group size. Another way of putting this is that if increased external resources decrease group size, it must mean that returns to scale are *not constant*: inspection of (11) reveals that either there are significant scale economies to group size (u_N is positive and large) or the marginal benefit to the club good is strongly decreasing in group size (u_{gN} is negative and large in absolute value), or both. The first effect will make the term Ny^*u_N in the denominator of (11) large, thereby increasing the likelihood that $\frac{dN}{dG} < 0$. Similarly, when $u_{gN} < 0$, it will be become more likely that $N + 2y^m f(y^m)\left(1 + N^2 y^m u_{gN}\right) < 0$, thereby also increasing the likelihood that $\frac{dN}{dG} < 0$.

3.4. A parameterized example

In order to illustrate these ideas, consider a simple parameterized example. Suppose that the objective function of villagers is given by:

$$V(c, g, N) = y - t + y\sqrt{1 + tN + G},$$

meaning that we have posed $u(g, N) = u(tN + G, N) = \sqrt{1 + tN + G}$. This is an example of the situation just described above in the discussion following the Proposition: u_N is positive and there are therefore positive returns to group size. Moreover, $u_{gN} = -\frac{t}{4(1+tN+G)^{\frac{3}{2}}} < 0$: the marginal benefit provided by the club good is decreasing in the size of the group. Intuitively, this is likely to be a situation in which additional external assistance will decrease group size, according to the reasoning following Proposition 1.

In this simple example, the optimal membership dues set by a member with income $\widehat{y}$ are equal to:

$$t(\widehat{y}, N, G) = -\frac{1 + G}{N} + \frac{N\widehat{y}^2}{4}.$$

As can be seen, external funding is passed on to CBO members in the form of a reduction in membership dues, but not in a one-to-one manner. Plugging this expression back into the objective function for a villager with income y (and noting that reservation utility for this functional form is equal to $2y$) yields:

$$\Phi = \frac{1 + G}{N} - y + \frac{N}{4}(2y - \widehat{y})\widehat{y}.$$

Note that $\Phi_y > 0$ when $\frac{N\widehat{y}}{2} - 1 > 0$, a condition that we shall verify *ex post*. Solving for the limit type y^* as a function of the member $\widehat{y}$ who decides on the value of the membership dues then yields:

$$y^* = \frac{\widehat{y}}{2} + \frac{1 - \frac{2G}{N\widehat{y}-2}}{N}. \tag{13}$$

Assume now for illustrative purposes that the income distribution within the village is given by a Pareto distribution whose cdf is equal to:

$$F(y) = \begin{cases} 1 - \sqrt{\frac{\underline{y}}{y}} \\ 0 \quad \text{otherwise} \end{cases},$$

where $\underline{y}$ is the lower bound on income in the village. For this income distribution, the relationship between the CBO's limit type and that of the median member is particularly simple and is given by:

$$y^* = \frac{y^m}{4}. \tag{14}$$

Finally, note that group size under these assumptions is given by:

$$N = \sqrt{\frac{\underline{y}}{y^*}}. \tag{15}$$

Equilibrium is then given by solving (13), (14) and (15) simultaneously for (y^*, y^m, N). This yields:

$$y^* = \frac{5+4G-\sqrt{9+8G}}{8\underline{y}}, \quad y^m = \frac{5+4G-\sqrt{9+8G}}{2\underline{y}}, \quad N = \frac{\underline{y}\left(1+\sqrt{9+8G}\right)}{2(1+G)}.$$

Recall that $\Phi_y > 0$ when $\frac{N\underline{y}}{2} - 1 > 0$. Substituting from the equilibrium configuration, it is obvious that the condition holds as long as $\underline{y} > 0$ and $G > 0$.

In this simple example, it is immediate that equilibrium group size is decreasing in external assistance, since:

$$\frac{dN}{dG} = -\frac{\underline{y}\left(5+4G+\sqrt{9+8G}\right)}{2(1+G)^2\sqrt{9+8G}} < 0,$$

confirming our initial intuition. A graphical illustration of the relationship between N, G and $\underline{y}$ is provided in Figure 1 where the vertical axis corresponds to N.

4. Identification strategy

Our theoretical model indicates that external funds can have ambiguous effects on CBO membership. Using census data from 177 Senegalese villages, we wish to identify the extent to which CBO membership and the marginal effects of various characteristics associated with CBO membership are affected by development aid. We have a two-period panel data set on household membership in CBOs and information on a vector of variables x that are potentially associated with membership. In addition, we can partition our sample into treated and non-treated villages. Approximately 75 % of the villages in our sample received PSAOP projects while the rest did not. In a first step, we test the effect of development aid on the likelihood of belonging to a CBO and focus on how the marginal effect of household characteristics such as social status, education, ethnicity, and geographical location within the village are changed by participation in the PSAOP CDD program. Second, we investigate whether treatment by the PSAOP affects assortative matching patterns. In particular, we investigate how the relevant metrics that determine whether households are in the same CBO are impacted by treatment.

The main econometric problem is that village- and household-level unobservables are likely to be important determinants of CBO membership and matching, as well as an important determinant of treatment status. We deal with this issue by estimating conditional logit models that control for time-invariant household or household-pair unobserved heterogeneity and by thus focusing on the effect of treatment on the marginal impact of various covariates. Since the choice of treatment villages for the PSAOP was determined in 2003 (and is therefore time-invariant), controlling for time-invariant unobservable heterogeneity allows us to account for any correlation that might exist between unobserved heterogeneity and treatment status: the parameter estimates reported in section 5 should therefore be interpreted as causal effects of the PSAOP.

4.1. Membership regressions

In order to assess whether the manner in which various household and village characteristics that determine CBO membership is changed by treatment we estimate the following equation:

$$P[m_{ivt}=1] = \lambda\left[x_{ivt}\alpha + D_{vt}x_{ivt}\beta + D_{vt}x_{iv}\delta + D_{vt}\gamma + \lambda_{iv} + \varepsilon_{ivt}\right], \tag{16}$$

where $m_{ivt} = 1$ if household i in village v at time t belongs to a CBO, and $m_{ivt} = 0$ otherwise, and $\lambda(.)$ is the logistic function. The vector of regressors x_{ivt} includes various characteristics of household i that vary over time and are potentially associated with membership in CBOs while x_{iv} includes various characteristics of household i that are time-invariant. The variable D_{vt} indicates treatment status at the village level: D_{vt} is equal to one if the village received a PSAOP project at time t and zero otherwise. Treatment status D_{vt} is interacted with the time-invariant individual characteristics such as ethnicity. This allows us to estimate a fixed effects logistic regression which will control for potentially correlated time-invariant heterogeneity λ_{iv} and to investigate how treatment status impacts the marginal effect of various time-invariant covariates. This last effect is given by the estimated values of the parameter vector δ. The corresponding effect for time-varying covariates is given by the parameter vector β.

4.2. Dyadic Regressions

Although regression (16) is useful, it falls short of our objective on two counts. First it cannot tell us whether geographical proximity matters: the distance between households is a relative concept, not an individual characteristic, and hence its effect cannot be studied using model (16). Second, it can only identify certain types of assortative matching. Regression (16) enables us to test whether CBO members are, say, systematically wealthier than non-members. But it cannot inform us whether CBOs are, for example, the result of homophily, with wealthy individuals matching with other wealthy individuals, or whether they imply wealthy individuals matching with their poorer brethren.

To solve this problem we apply the dyadic regression framework pioneered by Fafchamps and Gubert (2007). We consider the relationships of household i with each and every household $j \neq i$ in the village (and do the same for all the remaining $j \neq i$ households). The set of all links in village v at time t can then be summarized as an $(N \times N)$ matrix $M_{vt} = [m_{ijvt}]$ where N is the number of households in village v at time t, and $m_{ijvt} = 1$ when households i and j belong to a CBO, and $m_{ijvt} = 0$ otherwise. The diagonal elements are dropped because by definition a household is in the same CBO as itself. The dyadic relationship we analyze is non-directional. In other words, the relationship between peasant i and j is exactly the same as the relationship between j and i. Hence, it does not matter from which "direction" we analyze their interaction. Therefore, we drop the upper triangular portion of the matrix M_{vt} as well. This leads to a dyadic regression of the following form:

$$P\left[m_{ijvt} = 1\right] = \lambda\left[x_{ijvt}\alpha + D_{vt}x_{ijvt}\beta + D_{vt}x_{ijv}\delta + D_{vt}\gamma + \lambda_{ijv} + \varepsilon_{ijvt}\right], \tag{17}$$

where the notation is similar to that adopted in (16), though we can now account for *pair-specific* time-invariant heterogeneity through λ_{ijv}. This allows us to evaluate how treatment by the PSAOP has affected assortative matching patterns, while controlling for all time-invariant unobservables at the pair level.

As Fafchamps and Gubert (2007) point out, one must deal with two issues when estimating dyadic regressions: identification and inference. Regressors x_{ijvt} must enter an undirected dyadic regression in a symmetric manner so that the effect of (z_{ivt}, z_{jvt}) on m_{ijvt} is the same as the effect of (z_{jvt}, z_{ivt}) on m_{jivt}. This is no problem for attributes w_{ijvt} of the link between i and j, such as geographic or ethnic proximity. However, for attributes of households i and j regressors must be written in a way that preserves symmetry. In our set-up the dyadic relationship is non-directional since, by construction, $m_{jivt} = m_{ijvt}$ for all i, j. Taking the case of time-varying covariates as an illustration, symmetry requires that regressors satisfy $x_{ijvt}\alpha = x_{jivt}\alpha$.

A simple manner of satisfying this requirement is to specify:

$$x_{ijvt}\alpha = \alpha_0 + |z_{ivt} - z_{jvt}|\alpha_1 + (z_{ivt} + z_{jvt})\alpha_2 + |w_{ijvt}|\alpha_3, \tag{18}$$

where α_1 measures the effect of absolute differences in attributes on m_{ijvt}, α_2 measures the effect of the combined level of z_{ivt} and z_{jvt} on m_{ijvt}, and α_3 captures link effects.

How to interpret equation (18) can easily be illustrated with an example. Let z represent wealth. A positive α_2 implies that CBO members are systematically wealthier than non-members; its interpretation is thus similar to that of a coefficient that would be associated with wealth in equation (16). In contrast, a negative α_1 means that households that differ in their wealth levels are less likely to belong to the same CBO. In other words, a positive α_2 means that CBOs are made up primarily of wealthy households, while a negative α_1 means that members of the same CBO tend to have similar wealth levels, i.e., the rich team up with the rich and the poor with the poor. The specification given by (18) also allows one to identify pure relative effects, such as geographic distance or ethnic proximity. By including w_{ijvt} we can test, for example, whether households sort by geographical proximity or by ethnic group when joining a CBO.

The second problem relates to the estimation of standard errors. Obviously, observations in equation (17) are not independent. This is due to the presence of individual-specific factors common to all observations involving that individual. Therefore we have to correct for cross-observation correlation in the error terms involving similar individuals. Doing this also corrects for dyadic non-independence and in subsequent sections we only report standard errors corrected for two-way clustering.

5. Empirical results

5.1. Data

The sample at hand covers four regions (Fatick, Kaolack, St. Louis, Thiès) which were selected to cover three different geographical areas of Senegal and to get as broad a coverage as possible of different CBO activities. The survey design involves stratified sampling, with 13 sub-regional clusters (corresponding to a Senegalese administrative district known as a Communauté Rurale), 177 villages and 2,859 households. Villages in the sample have between 6 and up to 1,301 households. The surveys were undertaken in 2003 and 2008 under the auspices of the World Bank and were 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).

For the purpose of the surveys, a CBO is defined as an organization created by villagers to provide services to its members. 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. Separate questionnaires cover village infrastructure and CBO activities. Details on the surveys can be found in Arcand and Fafchamps (2008).

Summary statistics corresponding to our two econometric specifications are found in tables 1 and 2. It is apparent from the descriptive statistics that female participation in CBOs is significantly higher than male participation. The average household consists of roughly 9 individuals and is very likely to be headed by a man (92.4 %). Households are headed by older males (52 years of age on average), although the standard deviation is substantial (14.5 years). While roughly one third of the household heads report having Coranic education, the majority has no education at all (this constitutes the excluded category) and only 4.2 % of the household heads indicate having completed secondary education. The four major ethnic groups represented in the sample are the Serere, Toucouleur, Fulani and Wolof (the excluded category), with each representing between 20 and 30 percent of the village population. Other, smaller ethnicities account for only 5 % of the sample. Most households are located very close to the center of the village (at an average distance of slightly less than 11m) and the average household has less than one link to any of the village authorities (village chief, customary village chief, imam, marabout). The picture is similar for owned land: The average household owns 1 hectare, with a standard deviation of 0.72.

5.2. Membership regressions

We begin by estimating membership regression (16). Results are presented in table 3. Three sets of results are shown. In the first pair of columns, the dependent variable is equal to 1 if any member of the household belongs to a CBO. In the second pair of columns, the dependent variable is equal to 1 if any male member of the household belongs to a CBO. The third pair of columns does the same for female membership. The estimator is a conditional logit that controls for time-invariant household-specific unobservables. Robust standard errors corrected for clustering at the household level are reported in all cases. For each set of results, the first column reports the estimated coefficients and the second column gives the marginal effects at the sample mean.

5.2.1. Time varying covariates

The most striking aspect of the results appears at the top of table 3: treatment by the PSAOP has a significantly negative effect on CBO membership. Being treated by the program reduces the overall probability of a household member belonging to a CBO by 34.6%. A priori one might expect a CBO treated by an aid program to attract more members. But in line with the simple parameterized example of our theoretical model presented in section 3.4, we find evidence that the probability of CBO membership falls as a result of treatment. This result provides strong evidence against constant returns to CBO activities, since it contradicts the prediction of Proposition 1 (ii), and is compatible with Proposition 1 (i). As such, this finding indicates that either there are strong (positive) returns to group size ($U_N > 0$) or that the marginal benefit of CBO activities are strongly decreasing in group size ($U_{gN} < 0$).

As in Arcand and Fafchamps (2008), the coefficient associated with household size is positive, though it is insignificant. Thus, it cannot be argued that larger households are more likely to have a member who belongs to a CBO –perhaps because membership is perfectly correlated amongst household members. The same is true when we disaggregate membership decisions by gender. In contrast, though the age of the household head has no statistically discernable impact on overall membership, households with younger heads are more likely to produce male CBO members. As indicated by the coefficients associated with these variables interacted with the treatment dummy, treatment by the program has no impact on the marginal effect of either of these variables on the probability of CBO membership.

Households with educated heads (secondary education) are less likely to produce CBO members, with most of this effect stemming from the negative impact of secondary education on female membership. This negative effect of secondary education on CBO membership is overturned by treatment for overall membership (but not for males or females taken separately). The same impact of treatment can be seen for primary education, again at the overall household membership level. This result comes as no surprize: CDD programs such as the PSAOP are preceded by capacity-building activities that are geared towards increasing the marginal returns to human capital within CBOs, which are often involved, for example, in the adoption of new agricultural technologies.

5.2.2. Time-invariant covariates

Treatment by the program makes it less likely that wealthy households (as measured by their landownership) have a member who belongs to a CBOs. Most of this effect would appear to stem from female participation (the coefficient associated with the treatment dummy interacted with land ownership is statistically insignificant for male participation). Similarly, treatment by the program makes it less likely that households with extensive family ties with village authorities produce female CBO members. In contrast, treatment makes it more likely that households with family ties to village authorities generate male CBO members. There is thus some evidence that a CDD program such as the PSAOP incites women from households with little traditional social status to join CBOs, while it reinforces the elite nature of male membership.

The effect of treatment by the program on CBO membership also appears to work along the ethnic dimension. Being treated by the program and being Toucouleur increases the probability of participation in CBOs by 12.4% for males and reduces it by 32.9% for females. Similarly, for members of the Fulani ethnic group, treatment by the program increases the probability of a male belonging to a CBO by 40.7%, while it decreases the likelihood of female participation by 9.4%.

Finally, treatment by the program appears to operate in a differential manner depending upon a household's geographic location within the village. Being treated by the program and being further away from the village center increases the probability of overall CBO membership, with all of the effect coming from female participation. Since living on the village periphery is often associated with poverty, this could be taken as an indication that the PSAOP managed to reach poor households and draw some of their female members into the community through CBO membership.[1]

5.3. Dyadic regressions

The empirical analysis we have conducted so far teaches us three lessons: First, development aid has a large, negative, and statistically significant impact on CBO membership, and is therefore incompatible with constant returns to the benefits accruing to households from CBO activities. Second, the characteristics that determine membership in an environment without treatment differ systematically from those under treatment: the impact of treatment on CBO membership appears to vary systematically along the educational, wealth, ethnic and geographic dimensions. Third, the effects of treatment on male and female participation differ significantly. But these results do not tell us whether treatment by a CDD program such as the PSAOP makes CBOs more or less heterogeneous. To do this, we estimate the dyadic regression (17).

[1] All of these results remained largely unchanged when we included village characteristics, when we eschewed household-specific effects in favor of village-specific effects, and when we did not account for time-invariant heterogeneity. Our results are therefore consistent across a variety of different specifications. We also tested a household random effects model but it is rejected by the appropriate Hausmann test in favor of the fixed effects alternative that we have reported.

The dependent variable m_{ijvt} is equal to 1 if households i and j in village v participate in a CBO at time t, and 0 otherwise. As in the preceding section, we construct three dependent variables m_{ijvt}. The first one is equal to 1 if any members of households i and j participate in a CBO. The second (third) is equal to 1 if both households have a male (female) member in the same CBO. The total number of possible household pairs is 57,094. Descriptive statistics are presented in Table 2.

Apart from characteristics of pairs of households expressed as sums or as the absolute value of their difference, as detailed earlier, we include three distance measures w_{ijv} in the specifications that follow, all of which are interacted with the treatment dummy. First, physical distance between any two households is computed as the Euclidian distance between their grid coordinates according to the village map. Second, we construct a dummy variable that takes on the value 1 if both household heads belong to the same ethnic group. Finally, we build a dummy which is equal to one when two household heads share the same level of educational attainment. On average the distance between any two households is 19.05 meters, 90.3 percent of household pairs share the same ethnicity, while only 55.5 percent of pairs have the same level of education.

Our results are presented in Table 4. As with the membership regressions, we present results for overall, male and female membership. In all regressions we control for pair-fixed effects and standard errors are corrected for two-way clustering at the household level, as explained in section 4.2.

We begin by interpreting the results for overall CBO membership. First, note that the likelihood of two households belonging to the same CBO is reduced by 42.8% by treatment, mirroring the results found for the membership regressions. Ethnic and educational proximity, interacted with the treatment dummy, are significant: membership in the same CBO is more likely for households that do not share the same ethnicity, if they are treated by the program, with the marginal effect being equal to 14.9%. Similarly, treated households whose heads do not share the same level of educational attainment are more likely to belong to the same CBO. Thus, either the PSAOP makes people more alike in terms of education, or it renders villagers more willing to share their knowledge and learn from one another within the CBO context. In contrast to the two social distance measures, geographical distance interacted with the treatment dummy is not significant in predicting whether two households participate in the same CBO.

Treatment leading to more heterogeneous households joining the same CBO carries over to measures of wealth as well: while treated household pairs with larger total land ownership are less likely to belong to the same CBO, treatment leads to households that differ in landownership being more likely to match.

This phenomenon is reversed when it comes to household size and ties to traditional village authorities. While the sum of household sizes interacted with treatment status has a positive impact on the probability of membership in a CBO, indicating that bigger households are more likely to join CBOs, treatment leads to households of similar sizes joining the same CBO. Similarly, treatment leads to households which are similar in terms of family ties with authorities being more likely to match in terms of CBO membership.

We now disaggregate our results by gender. For male membership, results are presented in Table 4 columns (3) and (4). Contrary to overall membership, treatment has no statistically significant impact on the probability of a household pair belonging to the same CBO in terms of male membership. In analyzing the coefficients further we find that the effect of physical distance, interacted with the treatment dummy, remains positive and statistically insignificant as was the case for overall membership. The coefficient associated with the same ethnicity dummy interacted with treatment status is again negative and significant. At 4.7 % the marginal effect is, however, less pronounced than in the dyadic regression results for overall membership. Concomitantly, education levels have a positive though insignificant effect in the matching patterns of males. However, treatment does not lead to positive assortative matching for men in terms of social status: those that have similar connections with village authorities and who are treated by the program are less likely to be found in the same CBO.

The negative effect of treatment on overall participation associated with total land ownership remains. In some sense this result is surprising as the PSAOP aims at agricultural progress. It might however be the case that the program targets villagers with very small land holdings and provides them with training geared towards cultivating their plots more intensively. In contrast to the overall membership results, treated villagers with similar land holdings are more likely to be in the same CBO in terms of male membership. Household size interacted with the treatment dummy has a positive though insignificant impact on male participation in CBOs: there is thus no evidence in favor of homophily along this dimension for male participation.

Finally, Table 4 columns (5) and (6) report the results for the dyadic regressions for female participation. Here it becomes clear where the pronounced negative treatment effect stems from. The probability for any two women of households i and j teaming up in the same CBO is reduced by 58.8 % by treatment. This might constitute an indication of the PSAOP's target: given that the program aimed at increasing agricultural productivity through the adoption of new agricultural technologies, it may have mainly targeted men with women being left out. Knowing that Senegalese rural culture is dominated by men, the "agricultural advisors" trained by the PSAOP might have confined their attention to that audience. This might have pushed women away from joining CBOs and back to traditional agricultural production techniques. As food security is an important concern of the PSAOP, it is highly questionable whether the approach taken achieves the program's stated goals. This is because it is mainly women who cultivate food crops and prepare family meals.

In terms of social distance the results found for any two men teaming up are confirmed. Ethnic barriers for female membership are reduced by treatment, and the effect is far more pronounced than for men. Again, the effect of educational similarity is insignificant, while the coefficient on geographical distance is: this indicates that women living further apart are induced by treatment to join the same CBO, with the marginal effect being equal to 1.3 % for each additional meter separating them. Although the effect is not quantitatively large, it might be taken as an indication of the extension of social networks beyond proximate neighbors and family members that is induced by the program.

In addition, treatment by the program induces women to team up with other women who share similar household size or social status (in contrast, the sum of family ties in the pair reduces the likelihood of matching in terms of female CBO members). This result is in sharp contrast to male matching behavior. For women it seems to be the case that the CBO is a substitute for the family network, whereas for men it is a complement. Moreover, treatment leads to women who come from a female headed household being significantly less likely to team up with women from households headed by men. This was not the case for men. In contrast to men, where positive assortative matching in terms of landownership was induced by treatment, no such effect is apparent for women, since, when they are treated, they team up with other women whose households differ in terms of the number of hectares owned. The negative and significant effect of total landownership within the pair, interacted with the treatment dummy, for participation in general is confirmed.

The analysis indicates that, although having an overall negative effect on CBO participation, development projects at the grassroots level can break existing local structures and matching patterns. On the one hand this may come as a relief for all those who believe in community-driven development, because it confirms that measurable changes are possible at the individual and household levels. On the other hand it should also be a cause for concern. Breaking existing social structures might harm the local community by eliminating crucial reference points that would have been needed when the program ended. In addition, our results clearly show that men and women are differently affected in their behavior by treatment. Especially in the context of food security, one should be aware of the role of women as providers and therefore design projects that clearly address female concerns.

6. Conclusion

As shown in our theoretical model, participation in CBOs might decrease as a result of treatment by a program, when the returns to group size are particularly high or when the marginal impact of group size on the marginal benefits accruing to membership is negative. Our empirical results show exactly that, namely that the PSAOP had an overall negative impact on participation in village groups. Underlying this result is a transformation of group structure: presumably those people who did not benefit from the new situation induced by the program dropped out of the CBOs to which they hirtherto belonged. Concomitantly, treatment by the program attracts new members who, for a variety of reasons, chose not to participate in the absence of treatment. On average, the first effect dominates the second.

At the same time, treatment by the PSAOP leads, *ceteris paribus*, to more heterogeneous CBOs. Therefore, we conclude that channeling development aid through CBOs makes these organizations more inclusive in the sense that a number of tradition-bound assortative matching patterns are modified. Households with different ethnic backgrounds start teaming-up with each other. Wealth in terms of landownership becomes a less important determinant of membership. Similarly, groups become more inclusive in the sense that people living at the periphery of the village are more likely to join CBOs as a result of the program. As such, the program was partially successful along these dimensions. On the other hand, both ethnicity and landownership remain means of exclusion from CBO membership for women.

Our results have uncovered significant differences in the effect of treatment on male and female participation in CBOs. The dyadic regression results suggest that male membership was reinforced by treatment but that its effect on female participation was negative. Moreover, in terms of female empowerment, the program is not just poorly designed: it may even be counterproductive.

A very basic policy prescription that can be drawn from our findings is that grassroots development projects that target CBOs must be carefully designed and implemented if they are not to result, paradoxically, in a greater degree of social exclusion, with differentiation by gender playing a crucial role.

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A. Proof of Proposition 1(i)

Applying the Implicit Function Theorem to equation (10) in the text yields:

$$\frac{dN}{dG} = \frac{-\frac{dt}{dG} + F^{-1}(1-N)u_g\left(t\left(F^{-1}\left(\frac{N}{2}\right), N, G\right)N + G, N\right)\left(1 + N\frac{dt}{dG}\right)}{\left(\begin{array}{c} \frac{u\left(t\left(F^{-1}\left(\frac{N}{2}\right),N,G\right)N+G,N\right)}{f\left(F^{-1}\left(\frac{N}{2}\right)\right)} + \frac{dt}{dN} + \frac{dt}{dy}\frac{1}{2F^{-1}\left(\frac{N}{2}\right)f\left(F^{-1}\left(\frac{N}{2}\right)\right)} \\ -F^{-1}\left(1-N\right)\left[\begin{array}{c} u_N\left(t\left(F^{-1}\left(\frac{N}{2}\right), N, G\right)N + G, N\right) \\ +u_g\left(t\left(F^{-1}\left(\frac{N}{2}\right), N, G\right)N + G, N\right) \\ \times\left(t\left(F^{-1}\left(\frac{N}{2}\right), N, G\right) + N\frac{dt}{dN} + \frac{dt}{dy}\frac{N}{2F^{-1}\left(\frac{N}{2}\right)f\left(F^{-1}\left(\frac{N}{2}\right)\right)}\right) \end{array}\right] \end{array}\right)}. \tag{19}$$

Now substitute for the comparative statics of the optimal transfer function from equations (4), (5) and (6) which we evaluate at $\widehat{y} = y^m = F^{-1}\left(\frac{N}{2}\right)$. This yields:

$$\frac{dN}{dG} = \frac{1}{\left(\begin{array}{c} -t\left(F^{-1}\left(\frac{N}{2}\right), N, G\right) + \frac{Nu\left(t\left(F^{-1}\left(\frac{N}{2}\right),N,G\right)N+G,N\right)}{f\left(F^{-1}(1-N)\right)} \\ -NF^{-1}\left(1-N\right)u_N\left(t\left(F^{-1}\left(\frac{N}{2}\right), N, G\right)N + G, N\right) \\ + \frac{\left[-1 + NF^{-1}(1-N)u_g\left(t\left(F^{-1}\left(\frac{N}{2}\right), N, G\right)N + G, N\right)\right] \times \left(\begin{array}{c} \left[N + 2F^{-1}\left(\frac{N}{2}\right)f\left(F^{-1}\left(\frac{N}{2}\right)\right)\right]u_g\left(t\left(F^{-1}\left(\frac{N}{2}\right), N, G\right)N + G, N\right) \\ +2NF^{-1}\left(\frac{N}{2}\right)f\left(F^{-1}\left(\frac{N}{2}\right)\right)u_{gN}\left(t\left(F^{-1}\left(\frac{N}{2}\right), N, G\right)N + G, N\right) \end{array}\right)}{2NF^{-1}\left(\frac{N}{2}\right)f\left(F^{-1}\left(\frac{N}{2}\right)\right)u_{gg}\left(t\left(F^{-1}\left(\frac{N}{2}\right),N,G\right)N+G,N\right)} \end{array}\right)}.$$

Now use the FOC and the definition of the limit type to substitute for:

$$u_g\left(t\left(F^{-1}\left(\frac{N}{2}\right), N, G\right)N + G, N\right) = \frac{1}{NF^{-1}\left(\frac{N}{2}\right)},$$

and

$$u\left(t\left(F^{-1}\left(\frac{N}{2}\right),N,G\right)N+G,N\right)=\frac{t\left(F^{-1}\left(\frac{N}{2}\right),N,G\right)}{F^{-1}(1-N)}.$$

This yields:

$$\frac{dN}{dG}=\frac{1}{\left(\begin{array}{c} t\left(F^{-1}\left(\frac{N}{2}\right),N,G\right)\left[\frac{N}{F^{-1}(1-N)f\left(F^{-1}(1-N)\right)}-1\right] \\ -NF^{-1}(1-N)u_N\left(t\left(F^{-1}\left(\frac{N}{2}\right),N,G\right)N+G,N\right) \\ +\frac{\left[F^{-1}(1-N)-F^{-1}\left(\frac{N}{2}\right)\right]\left[N+2F^{-1}\left(\frac{N}{2}\right)f\left(F^{-1}\left(\frac{N}{2}\right)\right)\left(1+N^2F^{-1}\left(\frac{N}{2}\right)u_{gN}\left(t\left(F^{-1}\left(\frac{N}{2}\right),N,G\right)N+G,N\right)\right)\right]}{2N^2\left[F^{-1}\left(\frac{N}{2}\right)\right]^3f\left(F^{-1}\left(\frac{N}{2}\right)\right)u_{gg}\left(t\left(F^{-1}\left(\frac{N}{2}\right),N,G\right)N+G,N\right)} \end{array}\right)}.$$

Recalling that $F^{-1}\left(\frac{N}{2}\right)=y^m$ and that $F^{-1}(1-N)=y^*$, posing (for brevity) $t\left(F^{-1}\left(\frac{N}{2}\right),N,G\right)=t$ and recalling that all expressions in $u(.)$ are evaluated at $t\left(F^{-1}\left(\frac{N}{2}\right),N,G\right)$, then yields:

$$\frac{dN}{dG}=\frac{1}{\left[\frac{N}{y^*f(y^*)}-1\right]t-Ny^*u_N+\frac{\left[y^*-y^m\right]\left[N+2y^mf(y^m)\left(1+N^2y^mu_{gN}\right)\right]}{2N^2\left[y^m\right]^3f(y^m)u_{gg}}},$$

whose sign is manifestly ambiguous. $[QED]$

B. Proof of Proposition 1(ii)

When preferences are given by $y-t+yu\left(\frac{tN+G}{N}\right)$, the optimal transfer function is implicitly characterized by:

$$-1+\widehat{y}u'\left(\frac{tN+G}{N}\right)=0, \tag{20}$$

and the corresponding comparative statics are given by:

$$\frac{dt(\widehat{y},N,G)}{d\widehat{y}}=-\frac{u'\left(\frac{tN+G}{N}\right)}{\widehat{y}u''\left(\frac{tN+G}{N}\right)},\ \frac{dt(\widehat{y},N,G)}{dN}=-\frac{G}{N^2},\ \frac{dt(\widehat{y},N,G)}{dG}=-\frac{1}{N}. \tag{21}$$

Proceding as in the text, equilibrium group size is then characterized by:

$$-t\left(F^{-1}\left(\frac{N}{2}\right),N,G\right)+F^{-1}(1-N)u\left(t\left(F^{-1}\left(\frac{N}{2}\right),N,G\right)N+G\right)=0. \tag{22}$$

Applying the Implicit Function Theorem yields:

$$\frac{dN}{dG}=\frac{-\frac{dt}{dG}+F^{-1}(1-N)u'\left(\frac{t\left(F^{-1}\left(\frac{N}{2}\right),N,G\right)N+G}{N}\right)\left(\frac{1}{N}+\frac{dt}{dG}\right)}{\left(\begin{array}{c} \frac{1}{f\left(F^{-1}\left(\frac{N}{2}\right)\right)}u\left(\frac{t\left(F^{-1}\left(\frac{N}{2}\right),N,G\right)N+G}{N}\right)+\frac{dt}{dN}+\frac{dt}{dy}\frac{1}{2F^{-1}\left(\frac{N}{2}\right)f\left(F^{-1}\left(\frac{N}{2}\right)\right)} \\ -F^{-1}(1-N)\left[\begin{array}{c} u'\left(\frac{t\left(F^{-1}\left(\frac{N}{2}\right),N,G\right)N+G}{N}\right) \\ \times\left(-\frac{G}{N^2}+\frac{dt}{dN}+\frac{dt}{dy}\frac{1}{2F^{-1}\left(\frac{N}{2}\right)f\left(F^{-1}\left(\frac{N}{2}\right)\right)}\right) \end{array}\right] \end{array}\right)}.$$

Substituting from the comparative statics results given in (21), as well as from the FOC given in (20) and the definition of the limit type given in (22) then yields:

$$\frac{dN}{dG}=\frac{1}{\frac{Nt\left(F^{-1}\left(\frac{N}{2}\right),N,G\right)}{F^{-1}(1-N)f\left(F^{-1}(1-N)\right)}+\frac{G}{N}+\frac{\left[F^{-1}(1-N)-F^{-1}\left(\frac{N}{2}\right)\right]N}{2\left[F^{-1}\left(\frac{N}{2}\right)\right]^3f\left(F^{-1}\left(\frac{N}{2}\right)\right)u''\left(\frac{t\left(F^{-1}\left(\frac{N}{2}\right),N,G\right)N+G}{N}\right)}}.$$

Using the same short-hand notation as in part (i) of the Proposition yields the desired result:

$$\frac{dN}{dG} = \frac{1}{\frac{Nt}{y^* f(y^*)} + \frac{G}{N} + \frac{[y^* - y^m]N}{2[y^m]^3 f(y^m)u''}},$$

which is manifestly positive. $[QED]$

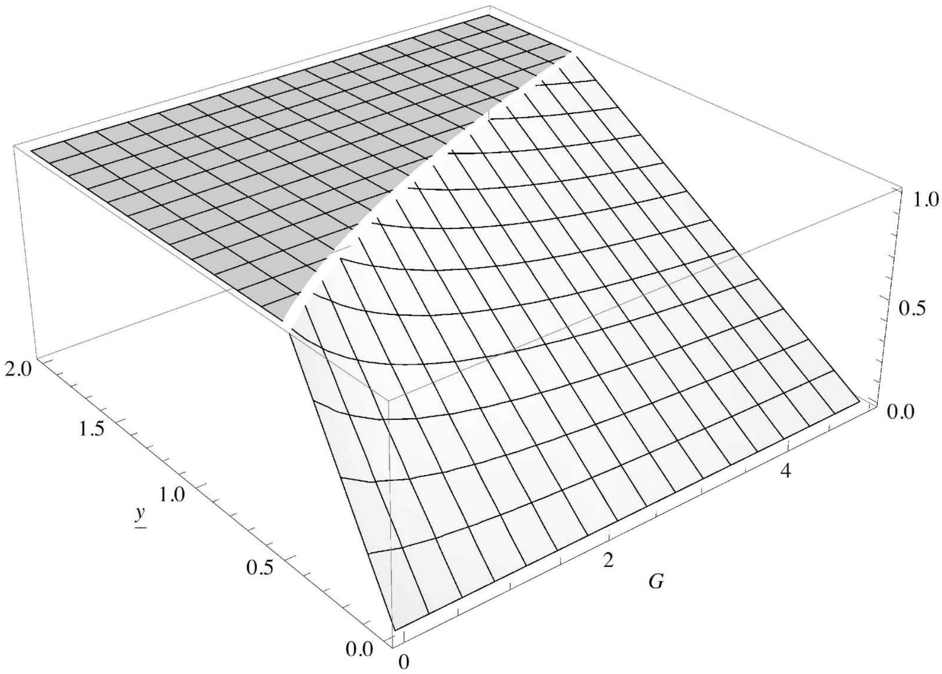

Figure 1: Graphical illustration of the relationship between N, G and $\underline{y}$

Variable	Mean	Std. Dev.
Overall membership	0.500	0.500
Male membership	0.243	0.429
Female membership	0.404	0.491
D	0.365	0.481
Time-varying characteristics		
log(household size)	2.199	0.604
Age of head	52.409	14.535
Coranic education	0.283	0.451
Primary education	0.081	0.273
Secondary education	0.042	0.202
D×(log(household size))	0.826	1.144
D×(age of head)	19.544	27.219
D×(Coranic education)	0.111	0.315
D×(primary education)	0.036	0.186
D×(secondary education)	0.022	0.146
Time-invariant characteristics		
Female head dummy	0.076	0.265
log(owned land + 1)	1.021	0.721
Serere	0.287	0.453
Toucouleur	0.213	0.410
Fulani	0.193	0.395
Other ethnicity	0.049	0.215
Family ties	0.796	0.841
Distance to the village center (in m)	10.832	10.005
D×(female head dummy)	0.031	0.174
D×(log(owned land +1))	0.367	0.651
D×Serere	0.039	0.193
D×Toucouleur	0.104	0.306
D×Fulani	0.094	0.292
D×(other ethnicity)	0.020	0.141
D×(family ties)	0.302	0.662
D×(distance to the village center)	4.341	8.691

Table 1: Descriptive statistics for the membership regressions.

Variable	Mean	Std. Dev.
Overall membership	0.500	0.500
Male membership	0.187	0.390
Female membership	0.383	0.486
D	0.388	0.487
Physical distance	19.049	14.590
Same ethnicity dummy	0.903	0.296
Same educational attainment	0.555	0.497
D×(physical distance)	8.159	14.286
D×(same ethnicity dummy)	0.349	0.477
D×(same educational attainment)	0.189	0.392
Absolute differences in household characteristics		
log(# of household members)	0.588	0.487
Female head dummy	0.136	0.343
Age of head	15.766	12.033
Family ties with authorities	0.542	0.815
log(owned land + 1)	0.400	0.489
D×(distance to the village center)	3.484	7.670
D×(# of household members)	0.237	0.433
D×(female head dummy)	0.057	0.231
D×(age of head)	6.018	10.529
D×(family ties with authorities)	0.221	0.603
D×(log(own land + 1))	0.156	0.365
Sum of household characteristics		
log(# of household members)	4.447	0.906
Female head dummy	0.155	0.387
Age of head	104.764	21.921
Family ties with authorities	1.612	1.475
log(owned land + 1)	1.964	1.216
D×(distance to the village center)	10.697	18.866
D×(# of household members)	1.764	2.276
D×(female head dummy)	0.064	0.261
D×(age of head)	41.369	53.605
D×(family ties with authorities)	0.630	1.228
D×(log(owned land + 1))	0.756	1.183

Table 2: Descriptive statistics for the dyadic regressions.

	(1)	(2)	(3)	(4)	(5)	(6)
	Overall membership		Male membership		Female membership	
	Coef.	Marg. E.	Coef.	Marg. E.	Coef.	Marg. E.
D	-1.520**	-0.346***	-1.723***	-0.326***	-1.336**	-0.288**
	(0.606)	(0.114)	(0.493)	(0.081)	(0.599)	(0.111)
log(household size)	0.119	0.029	0.160	0.033	0.008	0.002
	(0.137)	(0.035)	(0.123)	(0.029)	(0.129)	(0.030)
Age of head	0.001	0.000	-0.016***	-0.003***	0.008	0.002
	(0.006)	(0.001)	(0.005)	(0.001)	(0.005)	(0.001)
Coranic education	-0.180	-0.044	-0.277*	-0.057*	-0.235	-0.053
	(0.178)	(0.043)	(0.151)	(0.031)	(0.162)	(0.036)
Primary education	-0.344	-0.082	-0.386	-0.075	-0.249	-0.056
	(0.273)	(0.062)	(0.278)	(0.049)	(0.222)	(0.047)
Secondary education	-0.812**	-0.182**	-0.528	-0.099*	-0.971**	-0.188***
	(0.412)	(0.079)	(0.351)	(0.057)	(0.394)	(0.064)
Time-varying characteristics						
D×(log(household size))	0.310	0.076	0.139	0.029	0.295	0.068
	(0.224)	(0.054)	(0.167)	(0.034)	(0.215)	(0.048)
D×(age of head)	-0.001	0.000	0.001	0.000	-0.010	-0.002
	(0.008)	(0.002)	(0.006)	(0.001)	(0.008)	(0.002)
D×(Coranic education)	0.190	0.047	-0.060	-0.012	0.126	0.029
	(0.264)	(0.066)	(0.208)	(0.043)	(0.260)	(0.062)
D×(primary education)	0.810**	0.199**	0.592	0.136	0.239	0.057
	(0.388)	(0.092)	(0.353)	(0.086)	(0.333)	(0.080)
D×(secondary education)	1.144**	0.273**	0.358	0.080	0.603	0.147
	(0.504)	(0.108)	(0.423)	(0.099)	(0.506)	(0.126)
Time-invariant characteristics						
D×(female head dummy)	0.187	0.046	0.018	0.004	0.476	0.115
	(0.372)	(0.093)	(0.268)	(0.056)	(0.318)	(0.079)
D×(log(owned land+1))	-0.771***	-0.189***	-0.106	-0.022	-0.381**	-0.088**
	(0.153)	(0.038)	(0.117)	(0.024)	(0.155)	(0.037)
D×Serere	-0.049	-0.012	0.763**	0.178**	0.409	0.098
	(0.319)	(0.078)	(0.322)	(0.081)	(0.286)	(0.071)
D×Toucouleur	-1.799***	-0.347***	0.553***	0.124**	-1.871***	-0.329***
	(0.338)	(0.068)	(0.210)	(0.051)	(0.303)	(0.066)
D×Fulani	0.338	0.084	1.734***	0.407***	-0.431*	-0.094*
	(0.249)	(0.062)	(0.226)	(0.049)	(0.252)	(0.053)
D×(other ethnicity)	0.782**	0.193**	0.725**	0.168**	0.373	0.090
	(0.393)	(0.093)	(0.300)	(0.076)	(0.376)	(0.093)
D×(family ties)	-0.019	-0.005	0.161*	0.034*	-0.232**	-0.054**
	(0.121)	(0.030)	(0.087)	(0.019)	(0.099)	(0.023)
D×(distance to the village center)	0.041***	0.010***	0.001	0.000	0.021**	0.005**
	(0.008)	(0.002)	(0.009)	(0.002)	(0.009)	(0.002)
Log likelihood	-522.811		-695.985		-629.555	
Wald $\chi^2(19)$	163.200	[0.000]	141.690	[0.000]	398.440	[0.000]
Observations	1,930		2,252		3,026	

Table 3: Membership regressions for overall group membership, male and female group membership. Household fixed effects included. The first column of each category presents the estimated coefficient, the second column the marginal effect at the mean. Standard errors clustered at the household level are in parentheses. $^{*} - p < 0.10$, $^{**} - p < 0.05$, $^{***} - p < 0.01$.

	(1)	(2)	(3)	(4)	(5)	(6)
	Overall membership		Male membership		Female membership	
	Coef.	Marg. E.	Coef.	Marg. E.	Coef.	Marg. E.
D	-2.028***	-0.428***	0.192	0.046	-4.536***	-0.588***
	(0.224)	(0.035)	(0.251)	(0.059)	(0.292)	(0.031)
Distance						
D*(Physical distance)	0.027	0.007	0.042	0.010	0.082*	0.013*
	(0.040)	(0.009)	(0.057)	(0.014)	(0.047)	(0.007)
D*(Same ethnicity dummy)	-0.649***	-0.149***	-0.195**	-0.047**	-0.726***	-0.107***
	(0.075)	(0.017)	(0.090)	(0.022)	(0.082)	(0.014)
D*(Same educational attainment)	-0.300***	-0.069***	0.068	0.016	0.032	0.005
	(0.050)	(0.012)	(0.054)	(0.013)	(0.061)	(0.010)
Absolute difference in household characteristics						
log(# of household members)	-0.161***	-0.038***	0.003	0.001	-0.240***	-0.037***
	(0.039)	(0.009)	(0.048)	(0.012)	(0.043)	(0.007)
Age of head	-0.002	0.000	-0.004*	-0.001*	-0.002	0.000
	(0.001)	(0.000)	(0.002)	(0.000)	(0.002)	(0.000)
D*(Distance to the village center)	-0.004	-0.001	0.000	0.000	-0.021*	-0.003*
	(0.010)	(0.002)	(0.015)	(0.004)	(0.012)	(0.002)
D*log(# of household members)	-0.045	-0.011	-0.064	-0.015	-0.006	-0.001
	(0.066)	(0.016)	(0.072)	(0.017)	(0.080)	(0.012)
D*(Female head dummy)	0.121	0.029	0.062	0.015	-0.505***	-0.068***
	(0.160)	(0.039)	(0.131)	(0.031)	(0.180)	(0.022)
D*(Age of head)	-0.005*	-0.001*	0.014***	0.003***	0.002	0.000
	(0.003)	(0.001)	(0.003)	(0.001)	(0.003)	(0.000)
D*(Family ties with authorities)	-0.056*	-0.013*	0.159***	0.038***	-0.218***	-0.034***
	(0.031)	(0.007)	(0.033)	(0.008)	(0.042)	(0.007)
D*log(Owned land + 1)	0.188***	0.045***	-0.125**	-0.030**	0.294***	0.046***
	(0.052)	(0.012)	(0.058)	(0.014)	(0.062)	(0.010)
Sum of household characteristics						
log(# of household members)	-0.08***6	-0.020***	0.137***	0.033***	-0.174***	-0.027***
	(0.023)	(0.005)	(0.028)	(0.006)	(0.026)	(0.003)
Age of head	0.006***	0.001***	0.004***	0.001***	0.005***	0.001***
	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)
D*(Distance to the village center)	-0.013	-0.003	-0.029	-0.007	-0.051	-0.008
	(0.027)	(0.006)	(0.039)	(0.009)	(0.032)	(0.005)
D*log(# of household members)	0.625***	0.148***	0.014	0.003	0.844***	0.131***
	(0.040)	(0.009)	(0.041)	(0.010)	(0.046)	(0.010)
D*(Female head dummy)	0.011	0.003	0.048	0.011	0.038	0.006
	(0.146)	(0.035)	(0.114)	(0.027)	(0.148)	(0.023)
D*(Age of head)	-0.011***	-0.003***	-0.014***	-0.003***	-0.007***	-0.001***
	(0.001)	(0.000)	(0.002)	(0.000)	(0.002)	(0.000)
D*(Family ties with authorities)	0.064***	0.015***	0.047**	0.011**	-0.095***	-0.015***
	(0.017)	(0.004)	(0.022)	(0.005)	(0.018)	(0.003)
D*log(Owned land + 1)	-0.261***	-0.062***	-0.140***	-0.034***	-0.117***	-0.018***
	(0.025)	(0.006)	(0.023)	(0.006)	(0.031)	(0.005)
Observations	26,176		18,756		33,054	

Table 4: Dyadic Regression for overall group membership, male and female group membership. Pair-fixed effects included. Standard errors corrected for pair-wise clustering are in parentheses. The specification of the unconditional logit contains a constant. $^{*} - p < 0.10$, $^{**} - p < 0.05$, $^{***} - p < 0.01$.