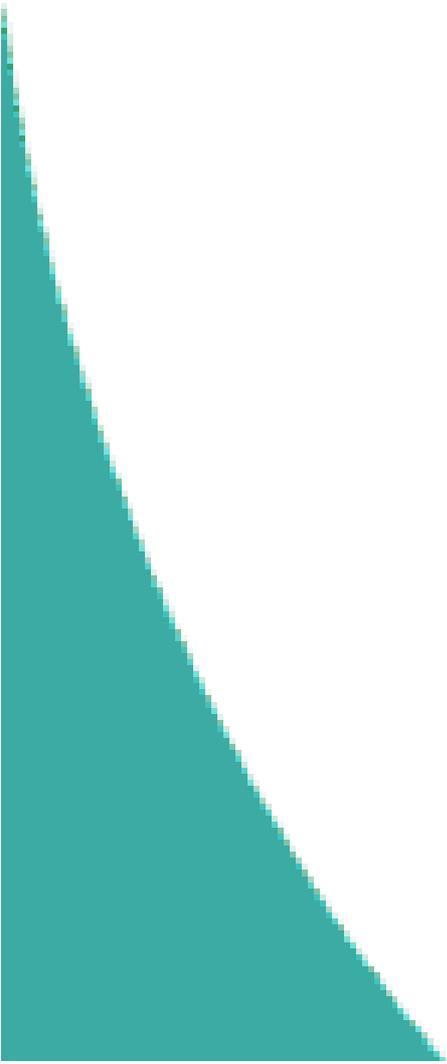


# BUILDING TRUST: CONDITIONAL CASH TRANSFERS AND SOCIAL CAPITAL

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# Building trust? Conditional cash transfers and social capital<sup>1</sup>

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## Abstract

In this paper we propose a measure of social capital based on the behaviour in a public good game. We play the public good game within 28 groups in two similar neighborhoods in Cartagena, Colombia, one of which had been targeted for over two years by a conditional cash transfer program that has an important social component. The level of cooperation we observe in the ‘treatment’ community is considerably higher than in the ‘control’ community. The two neighborhoods, however, although similar in many dimensions, turned out to be significantly different in other observable variables. The result we obtain in terms of cooperation, however, is robust to controls for these observable differences. In the last part of the paper we also compare our measure of social capital with other more traditional measures that have been used in the literature.

**Keywords:** Cash transfer programs, Social capital, social networks, collective action, cooperation, VCM, experiments, public goods provision.

**JEL Classification:** C92, D7, D85, H41.

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## 1. Introduction and Motivation

Conditional Cash Transfer programs have recently become very popular. International financial organizations, aid workers and policy makers have been promoting them as an effective way of simultaneously reducing short run poverty and break the intergenerational transmission of poverty by providing incentives to the accumulation of human capital.

A distinctive feature of most CCT, in addition to the fact that grants are typically targeted to women, is the fact that the conditions imposed on the beneficiaries often involve social activities, such as participating to meetings and courses or simply visiting a health centre. For many women, especially in rural areas, these conditions represent an opportunity to get out of the house and interact on a regular basis with women in similar situations. It has been claimed that these activities could improve trust and social relations within the community. On the other hand, when these programs are only offered to a subset of households in a small locality, this different treatment can introduce conflicts and jeopardize pre-existing relationships. One could therefore expect that these programs have an effect (positive or negative) on what is often loosely defined as social capital.

The impacts that CCT have had on schooling, nutritional status and a variety of other outcomes have been well documented. However, whether they had an effect on ‘social capital’ remains object of speculation and the topic of a variety of anecdotes. Even when there have been attempts to evaluate these impacts, typically it was done using qualitative rather than quantitative methods. This paper’s aim is to provide some concrete, hard and quantitative evidence on whether CCT have had an effect on ‘social capital’ in a specific context by combining survey and experimental methods

*Familias en Acción* is a conditional cash program that has become the flagship of the Colombian government social policy. Started in 2002 in small rural areas, it is now being expanded to large metropolitan areas. The program has an education component, conditional on school attendance, and a nutrition component, conditional on health centre visits as well as participation to meetings on the part of the mothers. The rural component of the program has been evaluated (see Attanasio et al. (2005)) and has been found to have effects similar to those that have been found in the case of PROGRESA and other CCTs in rural areas. In particular, *Familias en Acción* seem to

have a positive effect on some nutritional and health outcomes for young children living in rural areas and to have some considerable effects on the enrolment in secondary school in rural areas.

Because of its modality of operation, the program has also an important social component. Beneficiary mothers participate in the so-called '*Encuentros de Cuidado*' where, in addition to discussing specific issues related to health, hygiene, nutrition, etc., they also have the possibility to talk about other issues or even simply chat together. Conversations with program's officials and with beneficiary mothers indicate that these social aspects are indeed an important feature of the program: beneficiary mothers start new activities, get to know each other better and improve their ability to act as a group. A word that often comes up in these conversations is 'trust'. One could therefore conjecture that some of the activities connected to the program and which are one of its indirect effect might improve what is sometime referred to as 'social capital'.

This concept, as discussed, for instance in Fafschamp and Durlauf (2005), covers a variety of ideas. Social capital has been defined, for instance, as a set of underlying community networks that can be used by individuals for private or public benefit (Cardenas and Jaramillo, 2007: 5). Social capital could then be considered as the most effective means of internalizing externalities by agreements on who can produce externalities for whom (Robinson and Siles, 2002). It is this definition that we implicitly use in this paper. Unfortunately, it is difficult to measure concretely this type of outcomes.

The main aim of this paper is to construct a quantitative measure of 'social capital' and apply it to two different situations, one in which the program has operated for about two years and one in which the program has not yet started. While some qualitative studies do exist (for instance in the case of PROGRESA see Adato, 2000), to the best of our knowledge, no quantitative results exist. Comparing our measures of social capital in these two situations can be a simple way to test the hypothesis that the program has developed 'social capital' where it has operated. This hypothesis is obviously relevant for the specific program and context that we are analyzing but has a more general salience. Similar features characterize many of Conditional Cash Transfer programs, starting with the Mexican PROGRESA/ *Oportunidades*. And CCT programs have become extremely popular in Latin American in the last 10 years, with some type of CCTs operating in Brazil, Argentina, Nicaragua, Ecuador, Honduras, Chile, and Jamaica. Results on *Familias en Acción*, therefore, would be relevant for other situations as well.

The exercise we propose, of course is not without difficulties. For the inference about the link between the program and our measure of social capital to be legitimate it is necessary that the two situations one compares are, indeed, comparable. As in the standard evaluation problems, it is necessary to assume that the context in which the program does not operate can be used as a counterfactual for the context in which the program does operate. We will discuss the plausibility (or otherwise) of such an assumption in our specific context in what follows.

While the measurement of social capital using experimental games is not novel (see, for instance, Karlan, 2005) this paper is one of the first to use a VCM game for such a purpose. For this reason, in the last part of the paper, we relate our measure to other variables that we observe in our sample and that have been used in the literature as measures of social capital.

The rest of the paper is organized as follows. In the next section, we outline our methodology, which includes a proposal for the measurement of social capital and our attempt to estimate the effect of a conditional cash transfer program on it. We then move on to give some background information on the evaluation of *Familias en Acción* and on the specific context in which the test will be performed. The details of the measurement tools that will be used are explained in Section 4. In Section 5, we present our results on the effect of FA on social capital. In section 6, we discuss alternative measures of social capital and relate them to the one we propose. Section 7 concludes the paper.

## **2. The effects of a conditional cash transfer on social capital**

Our main purpose is to examine, by combining survey and experimental methods, the effect of a social intervention on individual and group behaviour and their ability to obtain better social and economic outcomes. There are two main difficulties in testing rigorously the hypothesis that Conditional Cash Transfers increase social capital. The first lies in the difficulty in obtaining a quantitative measure of social capital. The second is the standard evaluation problem of observing the counterfactual to a given intervention. We discuss these problems in turn.

### ***2.1. Measuring social capital***

There is now a large literature, covering several disciplines, that discusses social capital (see for instance Durlauf and Fafchamps, 2005). Without going into the substance of the issues, it is

widely recognized that measurement of social capital is a difficult and yet important issue. The World Bank promotes a standardized questionnaire to be implemented possibly within a large survey.<sup>2</sup> And yet, it is not clear how well these questionnaires can measure social capital. For this reason, we have followed a different approach, based on experimental games that are played in the field and whose outcome depends on the ability of individuals to trust each other and act as a group, possibly internalizing externalities. The idea behind the applications of the games in this context is to obtain ‘hard’ measures of social capital from the behaviour of subjects in situations where they can win ‘real money’ and where the game is designed so that how much is won depends on the ability of the subjects to act as a group and ‘internalize externalities’.

The games we use have been developed over the last three years, within a variety of evaluation initiatives performed by the Centre for the Evaluation of Development Policies (EDePo) and its Colombian partners in collaboration with researchers from the University of Oxford and the Universidad de los Andes in Bogotá to obtain measures of social capital. All these measures are based on experimental games applied in the field, rather than a laboratory. We have experimented with risk pooling games, trust games and public good games and have combined the information from these games with information collected in detailed surveys. These games have been applied in a variety of different situations, both urban and rural, in Colombia.<sup>3</sup>

The approach of using games to measure social capital is not novel: Karlan (2005), for instance, has used trust and a public good game to measure social capital in Peru. Here we propose a version of a public good game called the Voluntary Contribution Mechanism (VCM). This game is one of the experimental methods that have been often used in the literature to examine behavioural motivations such as trust and cooperation in groups.

The VCM experiment, introduced by Marwell and Ames (1979), captures trust and the willingness to cooperate among the members of a specific group by choosing whether to invest a token in a private account with private benefits or to invest the token in a group account (the public good) where the benefits of all members increases and the well-being of the entire group is improved. The general design is given in such a way that there is no incentive to invest in the group account

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<sup>2</sup> The World Bank promotes the Social Capital Assessment Tool (SOCAT) and the Social Capital Integrated Questionnaire (SC-IQ). Information on these instruments is found at: <http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTSOCIALDEVELOPMENT/EXTSOCIALCAPITAL/0,,contentMDK:20193059~menuPK:418220~pagePK:148956~piPK:216618~theSitePK:401015,00.html>

<sup>3</sup> In developing the games and this research agenda we have been working with Abigail Barr (Oxford) and Juan Camilo Cárdenas (Los Andes). Their help and support has been invaluable.

due to a higher individual payoff by investing in the private account. The dominant strategy is not to contribute at all, undermining the social outcome. If all in the group invest the token in the private account, the group will be worse-off than if all the members invest in the public account and the benefits for investing in the group account increase with the number of contributors.

The situation just described constitutes a typical social dilemma. The experimental literature has extensively documented that, typically, the Nash equilibrium is not observed, either in the lab or in the field. Groups of individuals seem to be able to partly internalize at least in part the externality built in the game. In general, contributions to the public good are in a range of forty to sixty percent of the group optimum (Carpenter and Cárdenas, 2006; Camerer and Fehr, 2003; Ledyard, 1995). At the same time, there seems to be considerable amounts of heterogeneity in the ability different groups have to solve this kind of problems. For this reason, this set up seems particularly attractive in devising a measure of ‘social capital’. The possibility of cooperation within a group is determined by multiple factors. Some results are now well established in the literature<sup>4</sup>:

- i. Inequality in payments decreases contributions (Anderson, Mellor and Milyo, 2004; Isaac and Walker, 1988a, 1988b);
- ii. repeated interaction in the same group increase contributions<sup>5</sup>;
- iii. communication among subjects increase contributions (Isaac and Walker, 1988a);
- iv. contributions unravel over time and decrease in the last round;
- v. the chance to punish or reward increases contributions (Bowles and Gintis, 2004);
- vi. non-anonymity and free-riding information of the players affects the decision to contribute (Andreoni, 1988; Bochet, Page and Putterman, 2006);
- vii. group heterogeneity has mixed effects on contributions (Cardenas and Ostrom, 2004; Cardenas, 2003 and IADB, 2007);
- viii. There is a learning process and a confusion factor referred to the rules of the game and the consequences of their decisions (Isaac and Walker, 1988a, 1988b and Andreoni, 1995, Palfrey and Prisbrey, 1997).

The incentives to invest in the group account are given by characteristics of the design, but overall, by the individual motivations concerning the group well-being. Individual attributes such

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<sup>4</sup> For a detail survey of these results see Camerer and Fehr (2003), Ledyard, (1995) and Cardenas and Carpenter (2006).

<sup>5</sup> The level of interaction is important to overcome the costs of collective action. The level of trust and cooperation increase with the number of interactions (with a positive outcome) between people and also reduce free riding incentives. This process generates social capital leading to individual preferences for the group interests over the individual benefits.

as altruism, trust, social distance from the other members (Cardenas, 2003), fairness (Rabin, 1993), reciprocity (Andreoni, 1988, 1995; Bowles and Gintis, 2004), a sense of affiliation as a member of a common group, or sympathy toward others in the group (Kurzban, McCabe, Smith, and Wilson, 2001), determine social cohesion in a group and strengthen the ability of its members to cooperate and overcome collective action problems. In addition, group attributes such as social norms and institutions, informal enforcement mechanisms (Carpenter and Cárdenas, 2006), concerns for social reputation, social reciprocity (Bowles and Gintis, 2004)<sup>6</sup>; and group identification enforce the group interests over the individual and lead to overcome the dilemma and to attain a higher level of contribution.

As detailed below, the VCM game we use is played in two rounds. The subjects first play the game individually and privately, without having the possibility of communicating with other players. After the first round (but before its results are revealed), they are given the possibility of talking and discussing strategies for the second round. Finally the second round is played, again individually and privately, before the results of the first round are announced. We use two different measures of social capital. The first is simply the proportion of players in each session that contributes to the public project in the second round. The second is the change in this proportion between the two rounds. This second measure aims at capturing the effects of communication on social outcomes. Notice that, while the literature, on average, reports an improvement between the two rounds, in principle the proportion of individuals contributing to the public good could decline as well as increase. If, for instance, in the talks it emerges that in the first round a big majority has played ‘private’ those who played public might realize that this is not an optimal strategy. On the other hand, communication is a mechanism which gives group members the chance to make explicit commitments and promises about what they will do; offers an opportunity for suasion among the members of the group about what is right or what should be done to obtain the highest benefit for all (Messick and Brewer, 1983). Finally, we have to take into account that communication can be a useful instrument to achieve the maximum social outcome if individuals are involved in an ongoing relationship, are able to identify each other and have information about behaviour in the past from others in the group.

In addition to our quantitative measure we also collect a survey from the participants to the game. In this survey, among other things, we also ask questions that have been suggested as possible

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<sup>6</sup> Defined by Carpenter and Mathews (2004) “as the act of demonstrating one’s disapproval at some personal cost, for the violation of widely-held norms (e.g., don’t free ride)”. Cardenas and Jaramillo (2007) defined it as “a predisposition of the network members to cooperate and to punish those who don’t, even at a personal cost” or the trust endowment of the social network.

measures of social capital. For instance, we ask whether individuals participate into some social activities (like voting) and whether they ‘trust’ their neighbors. We also include a set of questions on membership in social groups and organizations. These variables have been widely used as a proxy for social capital in the non experimental literature. A useful by-product of our exercise will then be the possibility of comparing our measure of social capital to these more standard measures.

## ***2.2. A quasi- experimental approach.***

In social sciences, whenever one is interested in measuring the effects of a social program on a given outcome, one invariably faces the problem of the construction of appropriate counterfactuals. The outcome that would occur in the absence of the program is, by definition, unobservable. Quasi-experimental methods try to identify these counterfactuals by comparing the outcome of interest observed for individuals exposed to the program to the outcome measured on ‘similar’ individuals not exposed to the program. By ‘similar’ is usually meant that, in the absence of the program, exposed individuals would have *on average* the same outcome as those they are compared to. When a large sample is available to study a given program and when the program is allocated randomly within that sample, in the absence of further complications (such as compliance, or contamination) the two groups are indeed comparable.

Unfortunately, in the case we study, we do not have neither a large sample (effectively we are considering two neighborhoods) nor a random allocation of the program. However, we still claim that the comparisons we will present are interesting. First, although not random, it seems that the allocation of the program between the units we will be considering was not driven by specific pre-existing differences among them. Second, the existence of differences in observable variables can be tested and, in case such differences are indeed present, they can be controlled for. In this case, the inference one would make on the effects of the program would be if the observable variables summarize all the systematic differences in the outcome of interest between the units being compared. Finally, one could hope to collect additional data in which the control unit is also exposed to the program so to be able to control not only for observable variables but also for unobservable factors that do not change over time and affect the outcome of interest in an additive fashion. We will come back to these issues when we discuss our findings.

### **3. *Familias en Acción*: institutional details of a conditional cash transfer**

Since its inception in 2002, *Familias en Acción*, a conditional cash transfer inspired by the Mexican PROGRESA, has become the flagship program of the Colombian government social policy. The program, which is targeted at the poorest 20% of Colombian households,<sup>7</sup> has two main components: a nutrition component directed to households with children less than 5 and an educational component directed at households with children aged 7 to 17. The nutritional subsidy is obtained if the young children are periodically taken to growth and development check ups. In addition, mothers are supposed to participate to the so-called '*Encuentros de Cuidado*', meetings in which a variety of issues are discussed and during which the mothers elect a representative that will be in charge of organize several of the program activities. The nutritional grant, roughly equal to 25 US\$, is targeted to households with at least a child less than 7 and is independent of the number of children in the household. The educational grant is available to households with school age children and is conditional on school enrolment and attendance. Each child in primary entitles the household to about 8 US \$ per month, while each child in secondary school entitles the household to twice as much.

The programme seems to have an important social component, in the sense that beneficiary mothers participate together to a variety of activities and get to know each other and see each other with much more regularity. The '*encuentros de cuidado*' and the health clinic visits are the places where these activities happen. For additional information on the *Encuentros de Cuidado* see Acción Social (2003).

After its initial expansion in rural areas the government decided to expand the program to urban areas. When this decision was taken, *Familias en Acción* identified a few urban situations to pilot the program. In particular, the program was started in some poor neighborhoods of Soacha (a large satellite city of Bogotá), in some 'comunas' in Medellin and in a neighborhood of Cartagena, called *el Pozón*.

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<sup>7</sup> In Colombia, most welfare programmes are targeted using the so called Sisben score, a poverty indicator that is updated periodically. On the basis of this score, households are assigned to one of six categories. *Familias en Acción* is targeted to the level 1 of Sisben.

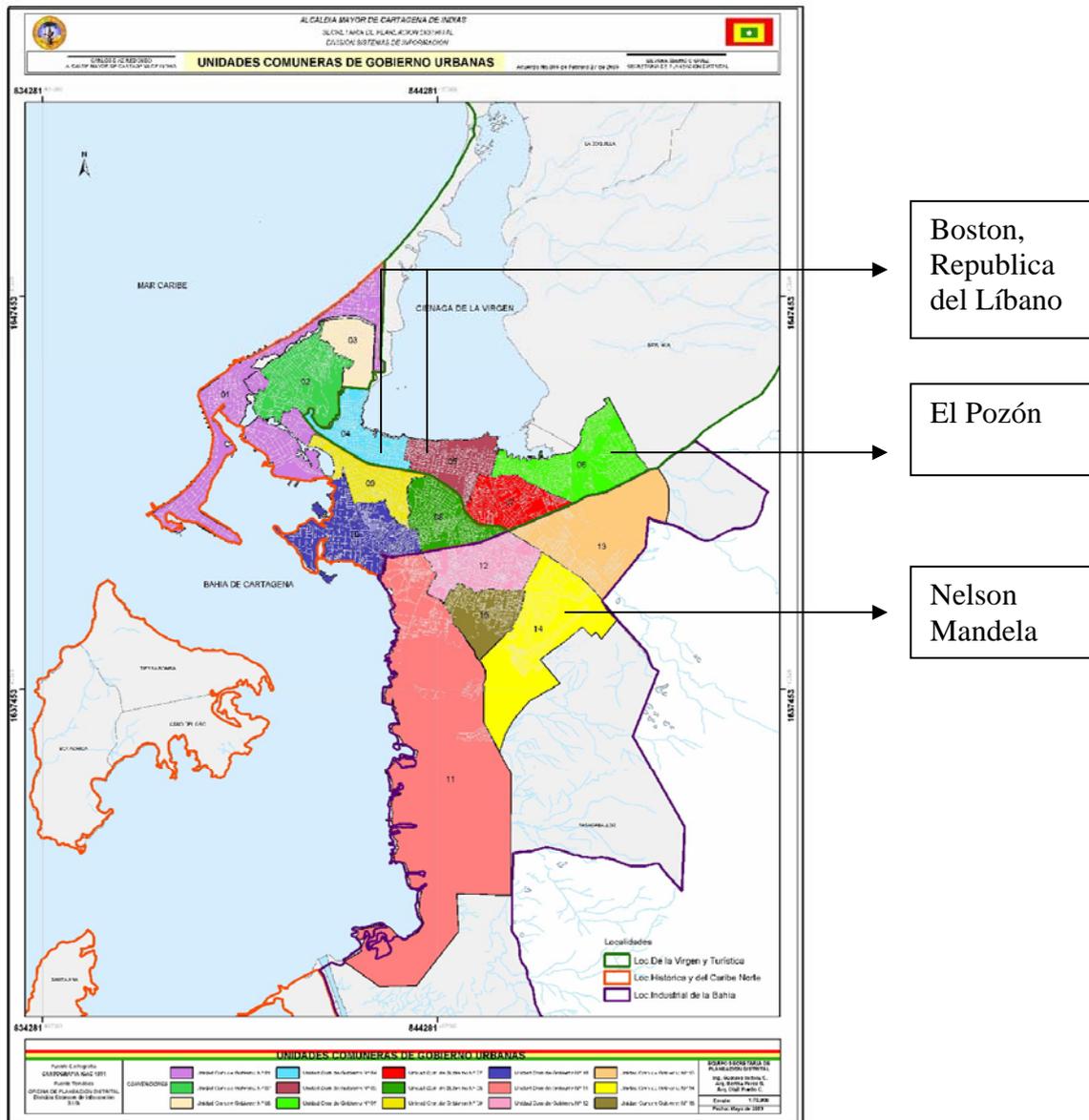


Figure 1: Map of Cartagena.

When starting the Cartagena pilot almost two years ago, the program administration was undecided among three different neighborhoods of Cartagena, *El Pozón*, and another two called *Nelson Mandela* and *Ciénaga de la Virgen*.<sup>8</sup> In the end, *El Pozón* was chosen because of contingent events (some floods that created temporary problems in that particular neighborhood). Since then the program has been developed in *El Pozón* but it has not been implemented in the other neighborhoods. In what follows, we will base our evaluation strategy on a comparison between *el Pozón* and *Ciénaga de la Virgen*. In particular, we chose as a ‘control’ two areas of *Ciénaga* called

<sup>8</sup> This information is based on conversations with programe’s officials.

*Boston* and *República del Líbano*. The reason we chose these areas in *Ciénaga* rather than *Nelson Mandela* was that, according to program officials, the social fabric of these two *barrios* was very comparable. Indeed, as can be seen in Figure 1, even the geographic position of the two *barrios* is quite similar.

After this first piloting phase, the Colombian Government decided to expand FA to all urban areas in Colombia. In September 2007 a new wave of massive inscriptions in the program started in every municipality of the country, regardless of its population size. The Government was hoping to raise the number of FA beneficiaries to 1.500.000 households by the end of the year.<sup>9</sup> In this context, the program was also being rolled out in the poorest neighborhoods of Cartagena, including *Ciénaga*. The data collection strategy was designed in such a way that *potential* beneficiaries in the control neighborhood would receive the program shortly after the implementation of the game.

The fact that the program was planned to be expanded to the control neighborhood, *Ciénaga de la Virgen*, has two advantages. First, it was possible, with the program officials' help, to identify the *potential* beneficiaries in *Ciénaga*. Second, when the program will be implemented in both neighborhoods, it will be possible to run a similar experiment again in both neighborhoods and collect similar data, to control for fixed unobservable effects.

## 4. The field game and the post-game survey

As mentioned in Section 2, to measure social capital in the two neighborhoods we analyze, we use a particularly simple version of the VCM that has been proposed by Cárdenas in several papers (see Cárdenas, 2007 and IADB, 2007). The subjects in the game were beneficiaries of the program in *El Pozón* and 'potential beneficiaries' in the control neighborhood of *Ciénaga*.

### 4.1. Sampling and recruitment

In each of the two neighborhoods, we played 14 sessions. In each session we aimed to include twenty five people recruited in the two neighborhoods among the beneficiaries (in *El Pozón*) and potential beneficiaries (in *Ciénaga*) of *Familias en Acción*.

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<sup>9</sup> In some of the new municipalities the government is trying a slightly different grant structure. In Cartagena, however, the program is operating in the way we described, as in the first wave of expansion.

In *El Pozón*, we invited 400 mothers from the 5000 who are registered as beneficiaries of *Familias en Acción*. The invitation letter was delivered one week before the experiments to the mothers. In *Ciénaga*, we invited randomly 400 households among potential beneficiaries (that is households of Sisben 1 with children) and the heads of the household received the invitation letter. For additional information about the instruments see the Appendix.

To minimize *cross talk* and its effects-participants talking about the experiment to other future players who will participate to subsequent sessions (see Cárdenas and Carpenter, 2006) - the 28 sessions in both *El Pozón* and *Ciénaga* were conducted simultaneously from July 11<sup>th</sup> to July 14<sup>th</sup>, 2007.

We had a total of 676 players, 342 people in *El Pozón* and 334 in *Ciénaga* (See table 1). Most of the participants (99%) were women. Among the participants in *Ciénaga*, there were seven men. The design for the study involves 25 people per session. Unfortunately, we could not have the same number of players in 14 sessions because some subjects failed to show up. However, the average of the session size was 24 people and there was no significant difference in sessions' size between the control and target neighborhoods.

**Table 1. The Sample**

Neighbourhood	El Pozón	Ciénaga	Total
Number of Participants	342	334	676
Number of Sessions	14	14	28
Size of the group for the smaller session	22	21	21
Size of the group for the biggest session	28	25	28
Average Size per session	24	24	24

#### ***4.2. Experimental Design and procedure***

The participants were invited to come to the local public high school. Upon arriving there, the subjects were given an identification number randomly and seated in semi-circle in a classroom. Each player receives an endowment of one token that could be invested in a private account or invested in a group account. The private decision is made simultaneously, and without discussion with anyone in the group. The earnings are calculated in the following way: If the player chooses to invest in the private account, the token is converted in \$5<sup>10</sup> and will be given entirely to her. In addition, each player also receives, regardless of how she has invested her own her token, \$0.40

<sup>10</sup> Units in thousands; thus, \$5 means COL\$5.000 (US\$ 2.56, according to the official exchange rate at that date TRM: 1US\$=COL\$1951,84 (Monthly mean average for July 2007. <http://www.banrep.gov.co>)).

for each token that is invested in the group account by any other member in the group of 25 players. Therefore, her total earnings at the end of this round are  $(\$5) + (\$0.40 \times \text{Sum of Tokens invested by the group})$ . If the player chooses to invest her token in the group account, she will receive 0.4 for each token that is invested in the group account by her and any other member in the group. Then, in this case her total earnings at the end of this round would be  $(\$0) + (\$0.40 \times \text{Sum of Tokens invested by the group})$ .

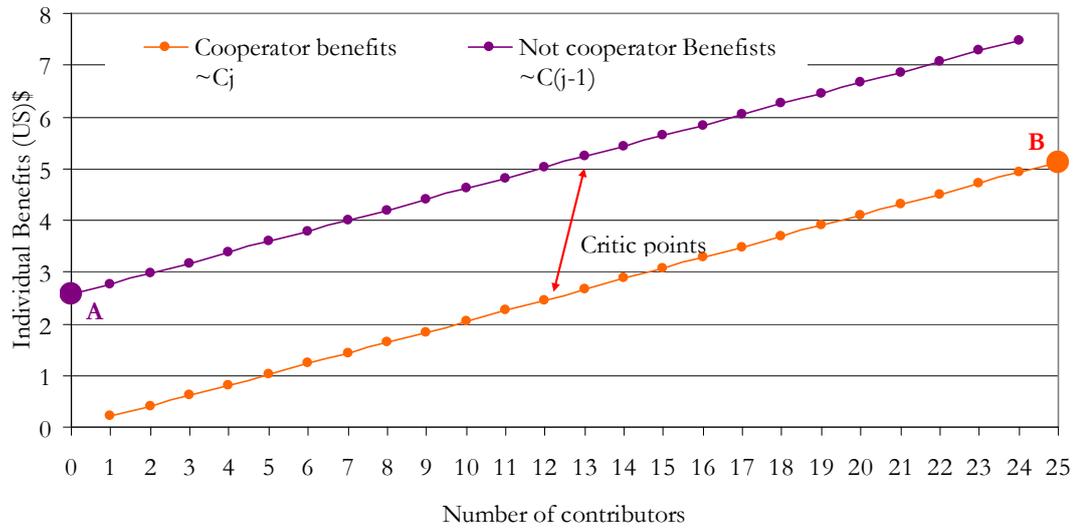
Each player makes her private decision by selecting a card which says if she is going to invest her money in the group account or to keep it for herself (i.e. private account). The experimenter then collects the “decisions cards,” totals them up, multiplies by \$0.40 the amount and credits the relevant amounts to each player. The relevant amounts, however, are only revealed and paid at the end of the session and after a second round of the same game.

In the first round, each player has to decide where to invest her token. The second round is a repetition of the first, except that the players were allowed to discuss for ten minutes before making simultaneously their private, anonymous decision. During the discussion, the players could talk about whatever they wanted but they could not leave the room.

No one, except the experimenter, knew for certain the other players’ contributions in the first round. The players did not even know their own payout in the first round when they discuss with the other players or when they play the second round. At the end of the session, however, the totals but not the individual strategies are announced. The players were paid in cash privately at the end of the session after taking a snack. The payoff resulting from both rounds are paid together with a show-up fee of \$2 to cover the transportation costs of each participant.

Each player could earn an amount between US\$6.50 and US\$10 from this game. The payoffs were chosen in such a way to correspond to the daily minimum wage for these neighborhoods - Col\$16000 (US\$8.20) and compensates the time which took each session, approximately three hours.

**Figure 2. The basic structure of the dilemma**



This experiment has been design to set a situation where there is a social dilemma, which is clearly illustrated in Figure 2. This figure shows the two possible individual outcomes (playing public or private) as a function of the number of individuals that contribute to the group account. Clearly, the dominant strategy for the  $j-1$  player is to choose not to invest the token in the group account because each token contributed yields only \$0.40 to its contributor, no matter what the others do. Therefore, each player would want to “free ride” on the others the benefits of the group account and the Nash equilibrium is that everyone invests in the private account (point A). In this case, the group earnings would be \$25 (players) x \$5 (private account return) = \$125. The social optimal where the group would be best off is that everyone contributes (point B) and each token contributed yields \$10 (25 (players)\*0.4 (group account return) to the others at no cost to them. In this case, the group earnings would be 25 (players) x \$10 (individual benefits of the group account) = \$250. Notice that it is necessary that at least 12 players contribute to the public account for a contributor to this account to earn the same as in the Nash equilibrium where everybody contributes to the private account.

### ***4.3. The post-game survey***

We complement the data collected in the game – that is the contribution decision by each individual in both rounds - with a post-game survey applied at the end of the session. This survey collects information about basic demographic variables as well as information about the game, household data, political attitudes, socioeconomic vulnerability and social capital measures such as membership in organizations and trust. Details about this survey are given in Appendix A. This

survey yields some insights into the individual characteristics that could affect the decision of contribution (i.e. volunteerism, participation in community activities, leadership, and attendance to their meetings) and gives also information to examine the external validity of our results.

The survey is completed by a module that aims at filling in a ‘networks map’ for each session, asking the subjects questions about their relationship to other participants. In particular, in the networks questionnaire, we asked to each participant her relationship with each other player in the group (“how do you consider person Y?”) in three categories: relatives, friends and acquaintances. The network information allows us to measure the degree of connectivity among the players in each session. We also asked if the player considered any other player as a leader in the group. It was possible to mention only one person. This variable provides us with information about the presence of leaders and is useful to determine their potential role in the game outcome.

Taking into account the characteristics of the social networks in the group is primal to our analysis. Social networks’ structure determines the degree of social cohesion in a group and the ability to overcome the costs of collective action and obtain benefits related with cost of transaction, information, and risk management. In the VCM experiment, this structure affects player’s communication with regard to the willingness to communicate with others<sup>11</sup> and the ability to do it in an effective an organized way to obtain the maximum social outcome. In addition, the structure of the social network could determine individual perception of group’s characteristics and network’s quality (Cardenas and Jaramillo, 2007); if there is not even a social network (i.e. all participants are unknown to each other) the cost of effective communication could be higher.

For the participants in the ‘treatment’ neighborhood the questionnaire included a question on the attendance to the *Encuentros de Cuidado* and the formation of social capital. In the recruitment process, using administrative data, we tried to guarantee that half of participants in *El Pozón* did not attend to the EC. However, when asked in the survey about attendance to EC, 97% of the mothers confirmed their participation, although, according to administrative data they did not attend. This pattern could be explained by the fact that the program’s officials helped us in the recruitment process and mothers might have been afraid of the consequences of saying in the survey that they do not attend.

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<sup>11</sup> Cardenas and Jaramillo (2007) applied a similar design with larger groups and found evidence that the players infer from their immediate neighborhood information about the global features of the network.

## 5. Results: do CCTs build social capital?

### 5.1. Unconditional comparisons

In an attempt to identify the effects of *Familias en Acción* on our measure of social capital, we start by comparing contribution rates to the public project in the two neighborhoods. The results are summarized in Table 2. The overall contribution rate is quite low at 20.0%. This means that on average only 5 players per session contributed to the public good. At this level, the contributors to the public good obtain about \$2 instead of the \$5 they could have obtained playing private even in the event of nobody contributing to the public good.

The difference between the two neighborhoods is remarkable: while only 6.6% of the participants in *Ciénaga de la Virgen* contributed to the public project in the first round of the game, in *El Pozón* the contribution rate in the first round is as high as 33%. This difference is significant at less than 1%.<sup>12</sup>

**Table 2. Experimental results by player**

	El Pozón	Ciénaga	Total
% contribution in G first round***	33.04	6.59	19.97
% contribution in G second round***	38.30	15.87	27.22
Earnings first round*** (US\$)	3.36	2.72	3.04
Earnings Second round*** (US\$)	3.49	2.94	3.22
Total Earnings without show up fee*** (US\$)	6.85	5.66	6.26
% Efficiency in the first round*** <sup>a</sup>	67.20	55.53	61.43
% Efficiency in the second round***	69.70	60.02	64.92

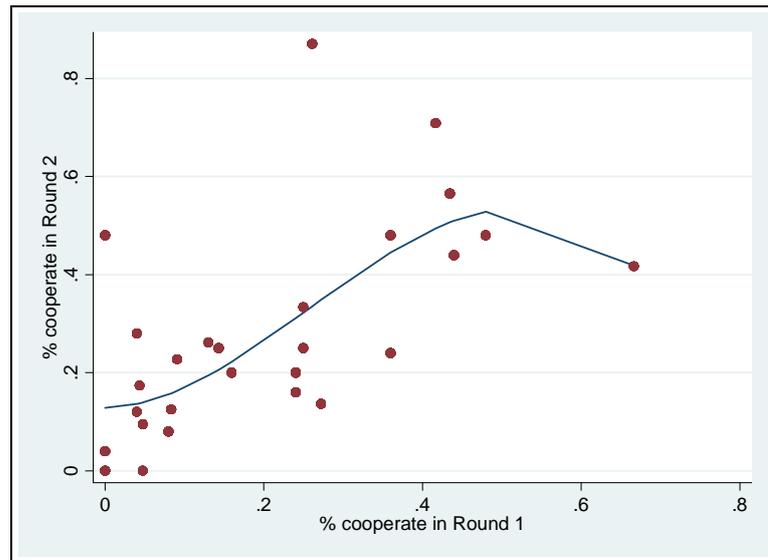
\* Difference significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

<sup>a</sup> The Efficiency index is calculated to each group as the sum of the earnings of people who decided P and earnings of people who decided to contribute (G) over the gains in the group if everyone in the session contributes, in other words, the real size of the cake over the size of the cake if everyone would have contribute.

Average cooperative behaviour in Round 1 and Round 2 are very correlated (see Figure 3). In the second round, in both neighborhoods, there is a movement towards social optimum: contribution rates move by 5.3 percentage points in *El Pozón* and by as much as 9.3% in *Ciénaga de la Virgen*. The improvement is statistically significant in both *El Pozón* and *Ciénaga*. The point estimate, therefore, indicates that communication is more effective in *Ciénaga* than in *El Pozón*. This difference, however, is not statistically different from zero, although this could be due to the relatively small sample size (14 sessions in each treatment and control). And even after the larger improvement in *Ciénaga*, the contribution rate remains much higher (and significantly so) in *El Pozón*.

<sup>12</sup> All inferences are performed computing standard errors that are clustered at the session level.

**Figure 3. Contribution rates in the group account in rounds 1 and 2.**



The overall level of cooperation we observe in our sample is very low if we compare our results with those in the existing literature playing similar games in the field<sup>13</sup> (Cardenas and Carpenter, 2006). In Colombia, an almost identical VCM game was played in 2006 within the evaluation sample of the rural component of *Familias en Acción* in 70 municipalities, some of which were exposed to the program. The results, analyzed in Attanasio and Phillips (2007), indicate a contribution rate of around 35%, not too different from that observed in *El Pozón*.

Taken literally, the results in Table 2 imply that the program, if that is the only difference between the two neighborhoods being considered, has a very strong effect on social capital or at least on our measure of social capital. We discuss the robustness of this result and its interpretation extensively below. The result on the *change* between the two rounds, besides being not statistically different between the two neighborhoods, is of difficult interpretation. As we mentioned above, both from a theoretical point of view and from the available evidence, communication can have different effects on the level of cooperation. A possible interpretation of the point estimate difference is that in *El Pozón*, people already had internalized (possibly through their experience in the program) the benefits of communication or they already had overcome the costs of knowing each other. In *Ciénaga*, instead, the communication was more *useful* in inducing more people to contribute to the public project.

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<sup>13</sup> 37% of endowment in the United States (List, 2004), 53% of endowment in Zimbabwe (Barr and Kinsey, 2002); 58% of endowment in Kenya (Ensminger 2000); Russia 52% of endowment (Gaechter et al., 2004) and 23% of endowment in Peru (Henrich and Smith, 2004). It should be noted, however, that, unlike in our game, in most of the VCM played in the field the endowment could be split between the public and private project. We impose a nothing or all choice so that our percentages are not strictly comparable to those in the literature.

The fact that the allocation of the program was not random and the fact that we are only considering two neighborhoods present, of course, the possibility that the observed differences in contribution rates could be driven by pre-existing differences between the two areas rather than being a consequence of the program. To check on this possibility we now turn to the analysis of data from the post-game survey.

## 5.2. Characterizing and conditioning on observables

In Table 3, we report the means of several variables we observe for the participants as well as tests of significance for the difference between the two neighborhoods. Unfortunately for our purposes, and to our surprise, important differences between the two neighborhoods emerge quite clearly.

**Table 3. Players' Socio Demographic characteristics**

Variable	El Pozón	Ciénaga	Total
<b>General Characteristics</b>			
%Woman***	100	97.90	98.96
Age (years)***	38.04	33.56	35.83
%Head ***	21.34	30.53	25.89
%Wife or partner***	76.90	62.87	69.97
%Single***	5.56	11.68	8.58
Number of Years living in the neighborhood***	14.49	22.37	18.38
%Displaced***	19.10	8.20	13.75
<b>Participation in <i>Familias en Acción</i></b>			
%Madre_lider***	16.70	-	-
Participation in <i>Encuentros de Cuidado</i>	97.06	-	-
<b>Level of Education (%)</b>			
None*	2.05	4.19	3.11
Primary Incomplete	18.12	18.56	18.34
Primary Complete	13.45	13.77	13.61
Secondary Incomplete**	37.43	30.24	33.88
Secondary Complete	23.98	25.45	24.70

\* Difference significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

In particular, players from *El Pozón* are older, less likely to be head of household or single, and more likely to be the wife or partner of the head of household. Moreover they are more likely to be displaced because of the internal conflict in Colombia and, consistently, they declare to be living in the neighborhood on average 8 years less than players in *Ciénaga*.<sup>14</sup> Finally, players from *El Pozón* are slightly more educated than those from *Ciénaga*.

<sup>14</sup> This result may be due to the fact that in *El Pozón* is easier to contact displaced people through FA operational networks, as they are beneficiaries of the programme. On the contrary in *Ciénaga* this population may be more difficult to recruit because they are normally socially isolated and extremely marginalized and vulnerable households.

In addition to the individual level variables, such as those reported in Table 3, the survey also contains household level variables. Table 4 reports the means and the test of significant difference between these means for some of these variables. The players in *El Pozón* seem considerably less poor than those in *Ciénaga*. They are more likely to own the house where they live, to be connected to piped water, to own several durables and other assets and less likely to have a dirt floor in the house. They are also much less likely to be unemployed. On the other hand we do not observe significant differences in access to credit or in food security.

**Table 4.**  
**Households' economic characteristics**

Variable	El Pozón	Ciénaga
<b>Dwelling characteristics</b>		
Number of people per room	3.22	2.88
Floor material (ground)***	24.3%	41.0%
Own housing***	82.7%	58.7%
Time spent to the nearest health center (minutes)	28.09	32.31
<b>Public services</b>		
Aqueduct***	94.7%	76.9%
Sewer System	64.3%	12.6%
Phone***	9.6%	26.6%
<b>Assets</b>		
Cell Phone***	86.3%	67.1%
Bicycle**	21.9%	14.4%
Tvcolor*	80.7%	74.6%
Washing machine***	23.7%	13.8%
Sound Player***	39.8%	25.1%
<b>Income variables</b>		
%Unemployed***	2.9%	10.8%
Access to credit	67.8%	66.8%
Access to formal credit	21.1%	22.2%
Food unsafety level (high)	9.6%	9.9%
Per capita Monthly Income** (COL\$)	49,364	43,550

\* difference significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

Clearly, some of the differences observed in Table 3 and 4 could have been induced by the program and, given the nature of the data; it is hard to disentangle the effect that FA may have had on many of the socio economic outcomes in the treated neighborhood. For instance asset tenure and monthly income may be clearly affected by receiving the benefits from FA in *El Pozón*. However, it is unlikely that other variables, such as education and housing (and given the duration of the program even the ownership of durables) could be affected so dramatically by it. These results, therefore, cast some doubts about whether the differences in our measure of social capital reported in Table 2 are indeed a consequence of the program: these differences were in all likelihood pre-dating the arrival of the program. It is therefore possible that the level of social capital was also different.

To shed some light on this issue, we condition on a variety of observable variables, at the individual, household and session level. As we are attempting to control for the possible existence of pre-program differences in social capital, we limit ourselves to variables that are unlikely to have been affected by the program.

In Table 5, we report results of a probit regression where we model the probability that an individual contributes to the public project in the VCM game as a function of several observables and of a dummy that indicates that the player is from the ‘treatment’ neighborhood. The four specifications reported in the Table differ in the type of variables we control for. In the Table we only report the marginal effect of the treatment dummy, indicating the change in the probability of contributing to the public project. We report the coefficients on some of these variables in Tables 6 and 7 and discuss their effect below. Here we simply comment on the effect of controlling for these variables on the estimated effect of *Familias en Acción*.

**Table 5. Program's Impact on the Cooperative Decision (First Round)**

	I	II	III	IV
Dummy <i>El Pozón</i>	0.283*** [0.072]	0.242*** [0.084]	0.203*** [0.076]	0.110** [0.045]
Basic Controls	YES	YES	YES	YES
Experimenter Controls		YES	YES	YES
Session Correlation Controls			YES	YES
Group Conformation Controls				YES
Observations	666	666	666	666

Marginal Probit. Cluster at the Session level. \* Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

The first thing to notice is the fact that, across specifications, the effect is sizeable and significant. Indeed, in the first three specifications, where we control for individual characteristics, as well as experiment and session correlation controls the effect is not different from the unconditional effect reported in Table 2.

While in Specification I we only control for individual and household characteristics, in the second specification we decided to control for ‘session’ characteristics. We discuss these variables in detail below. What we notice is that the point estimate of the coefficient goes down (to 24.2%), although the two coefficients are not statistically different.

An issue that worried us considerably on the field was the possibility that individuals who played in early sessions would ‘contaminate’ other individuals that were about to enter subsequent

session by talking to them and commenting on the game. While we tried to avoid these contacts as much as possible and instructed the subjects not to talk to subsequent players, some contacts were unavoidable. For this reason we control for the sequence order in which a particular session is played in a day and also for results in previous sessions.<sup>15</sup> While we do find these effects to be significant, we would not have expected they would affect much the size of the coefficient on the treatment, partly because they are present in both treatment and control sessions. The point estimate of the coefficient that measures the effect of the treatment is further reduced to about 20%, although, again, these estimates are not statistically different from those obtained in specification I.

Finally, in Specification IV we control for some indicators of session heterogeneity with variables such as the standard deviation of years of education, age level and years dwelling in the neighborhood. Controlling for these variables decreases the point estimates of the treatment effect substantially (to 11%) although it is still statistically significant.

We now discuss in detail the coefficients on the variables we control for and try to give them an interpretation. In particular, in Table 6, we report the coefficients on individual and household level variables, while in Table 7 we report the coefficients on session level variables.

Only 5 of the 17 structural socio economic controls that we include in the specification appear to be significant. We find that more educated players tend to cooperate more in the game as well as those belonging to larger families and living with a couple. Also, we find some evidence that cooperation is positively associated with better economic condition: players living in household connected to water by pipe are 10% more likely to contribute to the public account in first round.

In Table 7, we report the coefficients on session level variables, including both experiment and session composition variables. Although the script read by the experimenters was the same for all the sessions, it might be unavoidable that different individuals explaining the rules (and answering questions) might have an effect on cooperation. As we had three experimenters conducting the sessions, we control for their identity introducing two dummies (Table 7). In the case of Experimenter No 2, the measured effect (relative to Experimenter No 1) is positive but not statistically significant. Instead, for Experimenter No3, the effect is positive and significant. We

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<sup>15</sup> Particularly, in order to control for contiguous sessions correlation, we include in specification (III): a) a dummy for the first session each day; b) a variable capturing the deviation from the neighborhood mean of the average contribution to the public account in the previous 2 sessions.

have no clear interpretation of this result. However we report that Instructor 3 was the only man in the team.

**Table 6. Socioeconomic controls for the decision to contribute in the group account in the first round.**

	I	II	III	IV
Head of Household	0.053 [0.054]	0.059 [0.054]	0.055 [0.053]	0.044 [0.051]
If the players has a couple	0.068** [0.033]	0.070** [0.033]	0.070** [0.033]	0.054* [0.032]
Player's age	0.002 [0.002]	0.002 [0.002]	0.002 [0.002]	0.002 [0.002]
Level of Education (0 to 5)	0.021* [0.011]	0.021** [0.010]	0.020** [0.010]	0.021** [0.009]
Unemployed	0.052 [0.076]	0.071 [0.079]	0.068 [0.077]	0.061 [0.074]
Household size	0.014* [0.007]	0.015** [0.007]	0.015** [0.008]	0.016** [0.007]
Own Housing	-0.05 [0.043]	-0.054 [0.044]	-0.055 [0.044]	-0.058 [0.041]
Number of rooms in the house	-0.017 [0.018]	-0.018 [0.018]	-0.014 [0.018]	-0.014 [0.016]
Ground Floor (house)	-0.04 [0.030]	-0.04 [0.031]	-0.041 [0.031]	-0.034 [0.029]
Displaced (self-declared)	0.031 [0.039]	0.026 [0.038]	0.018 [0.036]	0.012 [0.034]
Number of Years living in the neighborhood	0.001 [0.002]	0.001 [0.002]	0.001 [0.001]	0.001 [0.001]
Fifth quintil per capita income	-0.011 [0.034]	-0.011 [0.035]	-0.007 [0.034]	0 [0.030]
Water by Pipe	0.127*** [0.030]	0.127*** [0.030]	0.126*** [0.030]	0.111*** [0.023]
Sewage	-0.041 [0.035]	-0.043 [0.034]	-0.047 [0.033]	-0.039 [0.029]
Phone	0.068 [0.055]	0.072 [0.055]	0.08 [0.057]	0.069 [0.053]
No Electricity	0.137 [0.121]	0.126 [0.122]	0.101 [0.121]	0.121 [0.136]
Observations	666	666	666	666

Marginal Probit. Cluster at the Session level. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Table 7. Experimenter, Session Correlation and Group Heterogeneity Controls for the decision to contribute in the group account in the first round.**

		I	II	III	IV
Experimenter Controls	Player did not understand the instructions		0.177 [0.148]	0.19 [0.145]	0.211 [0.143]
	Experimenter n°2		-0.036 [0.053]	-0.021 [0.054]	0.056 [0.042]
	Experimenter n°3		0.052 [0.060]	0.081 [0.054]	0.089*** [0.032]
Session Correlation Controls	First Session in the Day			0.093** [0.046]	0.112** [0.045]
	Deviation from the Mean of Previous 2 Sessions			0.493* [0.277]	0.441** [0.172]
Group Conformation Controls	Session size				-0.021** [0.009]
	At least one Man in the Group				0.201*** [0.046]
	Average Education in the Group				-0.090** [0.040]
	S.D. of Education in the Group				-0.248** [0.104]
	S.D. of Age in the Group				-0.017*** [0.006]
	S.D. of Years in the Neighbourhood in the Group				-0.038*** [0.011]
Observations		666	666	666	666

Marginal Probit. Cluster at the Session level. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

The controls on potential session correlation confirm that a certain correlation, probably induced by contamination, is indeed observed between contiguous sessions: the average cooperation rates are higher in the first sessions of every day and positively associated with the deviation from the mean of previous 2 sessions in every neighborhood. Finally we find that group conformation is extremely significant in determining individual cooperative decisions, even in the first round of the VCM game when communication between players is not allowed. First, we find that cooperation is easier in relatively smaller groups. Second, we observe that in those sessions where at least one man was playing (4 out of 28 and all in *Ciénaga*) cooperation rates are 20% higher. Finally we find strong evidence that group heterogeneity reduces incentives to individual cooperatives behaviour.<sup>16</sup> Indeed, in those session where players' education, age and time of residence in the neighborhoods are more disperse, cooperation rates are significantly lower (especially in the case of education). This result may indicate that players tend to cooperate more easily with peers, i.e. with players that they already know or whose observable characteristics suggest a certain degree of affinity.

<sup>16</sup> We calculate group heterogeneity as the standard deviations of selected characteristics in each session. In addition to these variables that reflect heterogeneity, we also control for the average level of education in the session.

### 5.3. Second round results

Having analyzed how the behaviour in the first round is affected by conditioning on observable variables and how that changes the coefficient we have interpreted as the effect of the program on social capital, we repeat the same analysis for the behaviour in the second round.

As with the first round, we run a probit to model the probability of contributing to the public project. The estimates of the program effect on the probability of contributing are reported in Table 8. In the first four columns of Table 8, we report a specification that is similar to the columns of Table 5. In the last column, instead, we also add variables that refer to behaviour in the first round. In particular, we include the individual decision of whether to contribute to the public project and the average level of cooperation in the first round. While players do not know this last variable when making their decisions, they can talk between rounds and learn about others behaviour. As it turns out, this variable is not significantly different from zero and its exclusion does not change the results. The coefficient on the treatment becomes insignificantly different from zero and is considerably smaller in size. As the ‘Round 1 controls’ include the contribution in the first round, which is affected by the program, the results should not be interpreted as the program not having an effect on the second round propensity to contribute. Only conditionally on what has happened in the first round, the effect is not there.

**Table 8. Program's Impact on the Cooperative Decision (Second Round)**

	I	II	III	IV	V
Dummy <i>El Pozón</i>	0.274***	0.188**	0.194*	0.156	0.058
	[0.067]	[0.095]	[0.103]	[0.249]	[0.254]
Basic Controls	YES	YES	YES	YES	YES
Experimenter Controls		YES	YES	YES	YES
Session Correlation Controls			YES	YES	YES
Group Conformation Controls				YES	YES
Round 1 controls					YES
Observations	666	666	666	666	666

Marginal Probit. Cluster at the Session level. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

In Tables 9 and 10, we report the coefficients on the control variables that were used for the different specifications of Table 8. Poorer households (with dirt floor and no access to electricity) cooperate less in second round. Time residing in the neighborhood improves cooperation. No other individual variable seems to be significant in determining the choice in Round 2.

**Table 9. Socioeconomic controls for the decision to contribute in the group account in the second round.**

	I	II	III	IV	V
Head of Household	0.047 [0.054]	0.057 [0.056]	0.057 [0.055]	0.014 [0.051]	0.004 [0.047]
If the players has a couple	0.127** [0.055]	0.129** [0.057]	0.127** [0.057]	0.103* [0.053]	0.095* [0.052]
Player's age	0 [0.003]	0 [0.003]	0 [0.003]	0 [0.003]	-0.001 [0.002]
Level of Education (0 to 8)	0.002 [0.015]	0.002 [0.015]	0.001 [0.014]	0 [0.014]	-0.005 [0.014]
Unemployed	-0.02 [0.063]	0.004 [0.063]	0.002 [0.063]	0.022 [0.067]	-0.005 [0.069]
Household size	0.007 [0.010]	0.007 [0.010]	0.007 [0.010]	0.002 [0.010]	-0.003 [0.010]
Own Housing	-0.037 [0.039]	-0.045 [0.037]	-0.046 [0.037]	-0.058 [0.039]	-0.04 [0.036]
Number of rooms in the house	0.004 [0.021]	0.003 [0.021]	0.004 [0.020]	0.014 [0.019]	0.018 [0.018]
Ground Floor (house)	-0.083** [0.036]	-0.080** [0.034]	-0.081** [0.034]	-0.060* [0.034]	-0.05 [0.038]
Displaced (self-declared)	-0.016 [0.037]	-0.023 [0.036]	-0.02 [0.036]	-0.012 [0.042]	-0.028 [0.049]
Number of Years living in the neighborhood	0.005*** [0.002]	0.005*** [0.002]	0.005*** [0.002]	0.005** [0.002]	0.004** [0.002]
Fifth quintil per capita income	0.061 [0.054]	0.06 [0.053]	0.061 [0.054]	0.069 [0.055]	0.07 [0.058]
Water by Pipe	-0.001 [0.059]	0.009 [0.057]	0.01 [0.056]	0.005 [0.050]	-0.024 [0.050]
Sewage	-0.07 [0.048]	-0.076* [0.043]	-0.076* [0.043]	-0.075* [0.041]	-0.063 [0.043]
Phone	-0.028 [0.051]	-0.025 [0.052]	-0.026 [0.052]	-0.034 [0.053]	-0.055 [0.051]
No Electricity	-0.178*** [0.064]	-0.170*** [0.063]	-0.171*** [0.062]	-0.174*** [0.051]	-0.185*** [0.044]
Observations	666	666	666	666	666

Marginal Probit. Cluster at the Session level. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

Table 10 shows that the choice in the first round is very strongly significant in determining players' behaviours in the second round, indicating a high level of persistence in cooperation choices. Also, it shows that group inequality (captured in terms of age, education or time of residency in the neighborhood) is detrimental to cooperation. Unlike our findings for Round 1, Table 10 indicates that when communication is allowed the presence of at least a man in the session produces lower cooperation levels.

**Table 10. Experimenter, Session Correlation and Group Heterogeneity Controls for the decision to contribute in the group account in the second round.**

		II	III	IV	V
Experimenter Controls	Player did not understand the instructions	0.009 [0.117]	0.001 [0.119]	-0.02 [0.121]	-0.093 [0.099]
	Experimenter n°2	-0.106 [0.079]	-0.104 [0.081]	-0.103 [0.088]	-0.11 [0.088]
	Experimenter n°3	0.098 [0.101]	0.095 [0.099]	-0.031 [0.067]	-0.053 [0.073]
Session Correlation Controls	First Session in the Day		-0.025 [0.084]	0.005 [0.069]	-0.056 [0.054]
	Deviation from the Mean of Previous 2 Sessions		0.132 [0.423]	-1.218*** [0.397]	-1.400*** [0.420]
Group Conformation Controls	Session size			-0.089*** [0.029]	-0.078** [0.035]
	At least one Man in the Group			-0.189** [0.075]	-0.207*** [0.069]
	Average Education in the Group			-0.254*** [0.099]	-0.174 [0.110]
	S.D. of Education in the Group			-0.458*** [0.115]	-0.281 [0.176]
	Average Age in the Group			0.071** [0.028]	0.070** [0.029]
	S.D. of Age in the Group			-0.087*** [0.026]	-0.075** [0.030]
	Average no. Years in the neighborhood in the Group			0.063*** [0.021]	0.058*** [0.022]
	S.D. of Years in the Neighbourhood in the Group			-0.028 [0.029]	-0.02 [0.029]
Round 1 controls	Player's decision in round 1				0.286*** [0.074]
	Average cooperation in round 1				0.232 [0.274]
Observations		666	666	666	666

Marginal Probit. Cluster at the Session level. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

Finally, we look at the changes in behaviour between the two rounds. We compute the difference between the dummy variables indicating the choice in Round 2 and that indicating the choice in Round 1. This variable therefore can take the values of -1, 0, and 1, indicating an improvement in cooperative behaviour, a no change and a worsening. To model such a variable we run an ordered probit, whose results we report in Table 11. We don't find any program's impact (detailed results are available upon request). This is consistent with the evidence that there is no significant difference in the *changes* in contribution between the two neighborhoods.

**Table 11. Program's Impact on the difference of the Cooperative Decision in both rounds**

	I	II	III	IV
Dummy <i>El Pozón</i>	-0.072 [0.195]	-0.176 [0.180]	-0.019 [0.211]	-0.113 [0.636]
Basic Controls	YES	YES	YES	YES
Experimenter Controls		YES	YES	YES
Session Correlation Controls			YES	YES
Group Heterogeneity Controls				YES
Observations	666	666	666	666

Marginal Probit. Cluster at the Session level. \* Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

## 6. Measuring Social Capital: which measures?

As we mentioned in the introduction, the use of the results of an experimental game to measure social capital is relatively novel. It is therefore useful to relate our measures to more conventional measures of participation that have been used in the literature. Before doing so, however, we look at some additional information we have available in our data set on the existence of networks among the game participants and on leadership. As we mentioned in Section 4.3, our database includes information about the knowledge that each individual has of the other individuals in the session, on leadership within the group and on other variables that are sometimes used as measures of social capital. In this section we analyze this rich information both to compare possible measures of social capital, some of which have been used in the literature and to check whether the program shows effects on some of them.

### 6.1. Connectivity and leadership

For every session we can construct a relationship matrix that describes the shape of existing networks among players. One-to-one relationships are characterized according to four possible categories: relatives, friends, acquaintances and strangers.

**Table 12. A Measure of session connectivity**

	Pozón	Ciénaga	Total
% relatives in the session***	0.1	1.1	0.6
% friends in the session***	5.9	2.9	4.4
% acquaintances in the session***	38.7	27.4	33.1
% connected (relatives, friends or acquaintances) in the session***	44.7	31.4	38.2

\* Difference significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

This information allows us to calculate a set of variables on session connectivity and eventually control for the strength of relationships in each group. The simplest measure of the “social integration” of each player within the session is given by the percentage of players that she reports as being relatives, friends or acquaintance in the group.

Table 12 reports the average levels for the various connectivity indexes in the two neighborhoods as well as a test of whether they are significant different. The table shows that social networks are generally stronger in *El Pozón*, where players are more likely to be participating in the game with friends and acquaintances. When we use an overall measure of connectivity, which subsumes the three possible categories of relationship, we find that on average in *El Pozón* each player declares to “know” 45% of the other players in the session, 14% more than in *Ciénaga*. Intuitively, this might be partly due to the social networks established amongst beneficiary women through FA. However, Table 12 shows that in *Ciénaga* players are more likely to be interacting in the same session with their relatives than in *El Pozón*. One hypothesis here is that the game recruitment process in *Ciénaga* exploited existing family networks.

If we think that the frequency of ‘friendships’ and ‘acquaintanceship’ are measures of social capital, the results in Table 12 are consistent with the tables above that indicate an effect of the program on social capital.<sup>17</sup>

The same information on networks also allows us to calculate three interesting measures of leadership, respectively a) the proportion of players that are referred to as leaders in each session b) the proportion of players that indicate at least one leader in the session and c) the proportion of players supporting each one of the leaders in the session (leader popularity).

**Table 13. Leadership Measures (%)**

	<b>Pozón</b>	<b>Ciénaga</b>	<b>Total</b>
Players reporting at least one leader in the session***	90.1	35.3	63.0
Players reported as leader in the session***	43.9	22.8	33.4
Leader popularity in the session*	8.0	6.0	8.0
Madre Lider in the session	17.0	-	-

\* Difference significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

<sup>17</sup> It is difficult to imagine that the programme affects the frequency of relatives. Of course, controlling for the presence of relatives can be important in explaining the behaviour in the VCM game. However, given the small number of relatives, the results we reported above do not change if we add to the list of control variables the connectivity index constructed with the presence of relatives. For this reason we simply have not reported the results of this specification that are available upon research.

Table 13 shows that leadership mechanisms are stronger in *El Pozón*, possibly in association with the social dynamics fostered by FA. We find that 90% of players in *El Pozón* is able to indicate at least one leader in the group, whereas this happens for just 35% of the players in *Ciénaga*. This variable can be considered as a good measure of empowerment.

Also, leadership seems to be relatively more dispersed in *El Pozón*, where 44% of the players are signaled as being leaders (by at least one member in the session). On the contrary, in *Ciénaga* reported leadership is concentrated on a smaller number of players (23%). Interestingly, in *El Pozón* the rate of reported leaders is significantly higher than the proportion of *Madres Líderes* (elected FA beneficiary representatives) in the sample.<sup>18</sup>

The popularity of leaders (that we calculate as the proportion of players reporting each one of the leaders in the session) is low in both neighborhoods, suggesting that a certain fragmentation affects the patterns of leadership consolidation in the social context of the study. It is interesting to note that the popularity of *Madres Líderes* is higher than the average (it reaches 10%).

## ***6.2. Alternative measures of social capital***

As we mentioned in Section 4.3 the post game survey also included a large set of questions aiming at measuring players' social capital from different perspectives than the experimental one.

In Table 14, we present some descriptive evidence of players' characteristics in terms of civic participation and membership in social groups and organizations, which is one of the most common proxies for social capital. As with previous tables, Table 14 reports the averages of the relevant variables in the two neighborhoods as well as information on a test of the hypothesis that these averages are the same.

While the differences between *El Pozón* and *Ciénaga* are not always significant, for several variables, participation in some activities seems to be higher in the former than in the latter, while the opposite is true for others. The probability that players participate in at least one civic group is higher in *El Pozón*. This seems to be mostly associated with the fact that women participate more intensively in Religious Associations<sup>19</sup> and in State Sponsored Activities (which may include FA

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<sup>18</sup> We find that 84% of *Madres Líderes* are reported as being leaders in the session.

<sup>19</sup> It excludes religious functions

associated activities like training sessions an the *Encuentros de Cuidado*). Players in *Ciénaga*, however are more active in neighborhood committees (*Juntas de Acción Comunal*), which are probably the most institutionalized space for civic participation in Colombia.<sup>20</sup> Finally, when asked if they attend meetings to participate in decisions concerning neighborhood life and if they participate in voluntary work in their neighborhood (especially physical infrastructure improvement), players in *El Pozón* show higher rates of civic participation.

**Table 14. Civic Participation by neighborhood (%)**

	Pozón	Ciénaga	Total
Membership in at least one organization*	43.57	33.53	38.61
Religious**	36.24	24.11	31.03
Educational	19.46	33.93	25.67
Accion Comunal**	16.11	29.46	21.84
Environmental management	14.77	8.93	12.26
Charity (other than as beneficiary)	6.71	5.36	6.13
Cultural or athletic	4.7	7.14	5.75
State-sponsored activities*	4.7	1.79	3.45
Surveillance association	2.68	4.46	3.45
Labor union or sector association	3.36	1.79	2.68
Political movement or party	1.34	3.57	2.3
Participation in neighborhood decisions***	69.02	40.06	54.69
Voluntary work in the neighborhood***	71.81	51.39	61.81

\* Difference significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

Table 15 shows some additional evidence concerning the quality of players' membership in the civic groups and associations reported in Table 14. All indicators show that civic membership is more “intense” in *El Pozón*. Players in the treated neighborhood are likely to spend more time in the respective organizations (both in terms of attendance to meetings and of frequency). Also, they are more likely to be involved in responsibility roles within the organizations and to contribute with money or voluntary work<sup>21</sup>.

**Table 15. Quality of Civic Membership by neighborhood (%)**

	Pozón	Ciénaga	Total
Attendance to the meetings*	43.57	33.23	38.46
Decision-Maker*	39.77	27.25	33.58
Leader*	26.02	10.78	18.49
Supports with money or voluntary work*	41.23	29.94	35.65
Frequency (Number of hours)*	12.51	5.23	8.91

\* Difference significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

<sup>20</sup> This results may confirm previous analysis suggesting that FA may be stimulating some mechanism of substitution of the traditional forms of civic participation with new ones (see Pellerano, 2004)

<sup>21</sup> For these indicators we ask to the subjects : Do you attend the meetings?, do you participate in the decision processes?, are you one of the leaders in the group?, do you support the group with money or voluntary work? And usually, how many hours per month you spend by attending to this group? See Appendix.

Our review of possible alternative measures of social capital concludes with the analysis of another proxy, electoral participation, which has been widely used in literature, and a set of direct question on trust and social preferences similar to those commonly included in questionnaires aimed at ‘measuring’ social capital. These results are reported in Table 16.

**Table 16. Alternative Social Capital Measures**

	Pozón	Ciénaga	Total
Vote Local Elections***	60.23	44.31	52.36
Vote Presidential Elections***	84.21	49.40	67.01
Trust**	8.18	4.49	6.36
Trust (index 0-2)***	0.84	0.66	0.75
Perception of cooperation in the community **	28.00	20.00	24.00

\* Difference significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

Table 16 shows that electoral participation is significantly higher in *El Pozón* than in *Ciénaga*<sup>22</sup>. The difference is quite striking in the case of Presidential Elections, where FA beneficiaries voted 35% more than non beneficiaries.<sup>23</sup>

Directs measures of trust yield particularly low estimates of ‘social capital’, with just 6% of the players manifesting to trust the majority of their neighbors. When calculated with a trust index (which goes from 2 to 0 respectively if the player claims to trust the majority, a few or none of its neighbors) players in *El Pozón* show higher pro-social attitudes<sup>24</sup>. Moreover, they report a different perception of other’s social preferences (such as altruism and reciprocity) in the community, for example when asked if “most of the people try to help in the community”.

The use of direct survey questions on trust has been strongly questioned as a poor indicator of social capital in comparison with experimental outcomes. In the following section we will discuss the association between cooperative behaviour in the VCM game and other possible measures of social capital.

<sup>22</sup> We asked for the last local elections in Cartagena (Gobernador, mayor, members of the Asambleas Departamentales, Concejos Municipales and Juntas administradoras locales). They were held seven months after the inscription in the program and four months before the beginning of the program in El Pozón. Presidential elections were held eleven months after the beginning of the program.

<sup>23</sup> This evidence is suggestive of the level of political rentability of a program such as *Familias en Acción*. We are not concerned with this issue here.

<sup>24</sup> We ask to the subjects : “In general, do you think that in your community...? The options are: It is possible to trust in few people, It is not possible to trust in anyone, It is possible to trust in most of the people.

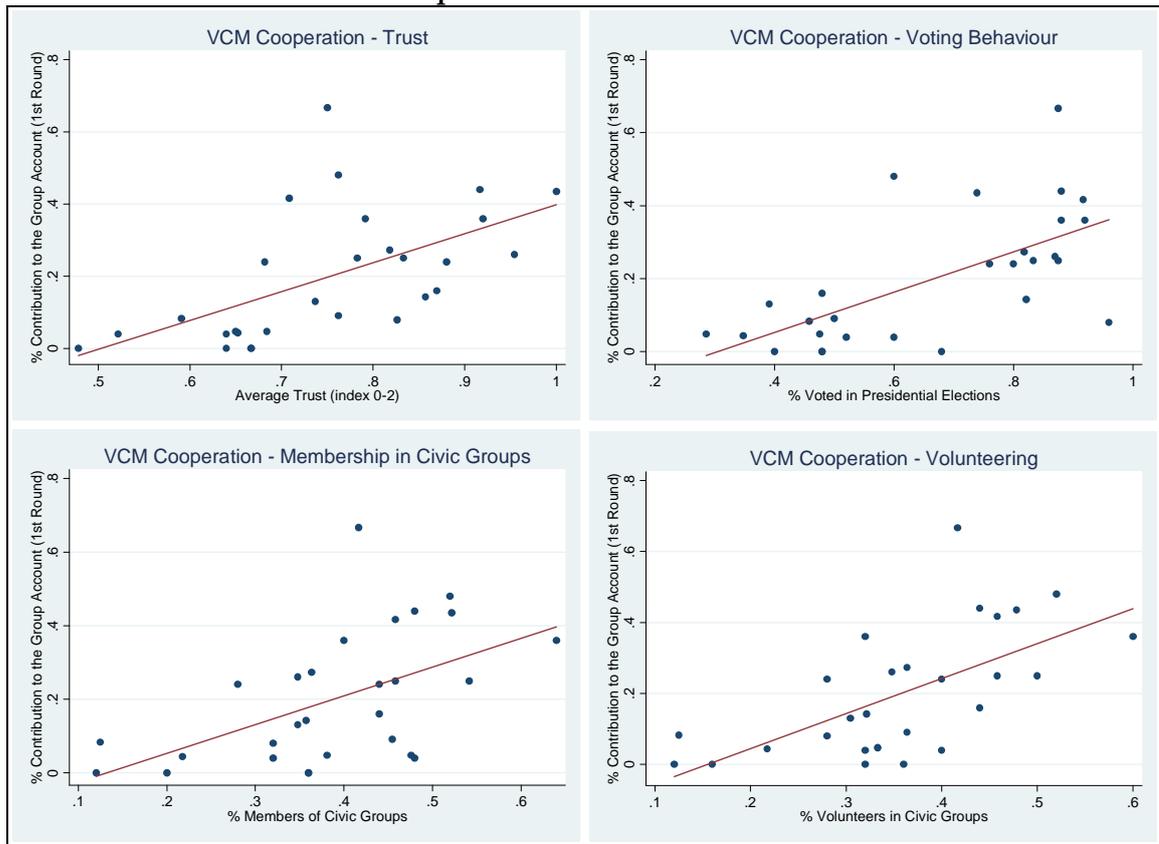
### ***6.3. How does participation in the VCM game correlate with alternative measures of social capital?***

We have now presented descriptive evidence on several possible measures of social capital. Some of these measures have been widely used in the literature. We have also shown suggestive evidence on whether the *FA* program has had an effect on these measures and found that, for some of them, like with our measure based on behaviour in a public good game, the program seems to have had an effect. We now relate directly our measure with the more traditional ones. We start, in Figure 4, by presenting some simple scatter diagrams relating average cooperation in the VCM and four alternative measures of social capital averaged at the session level.

Overall, our measure of social capital seems to co-vary remarkably well across sessions with the four more traditional measures we have considered in Figure 4: an index of trust, based on the answers to subjective questions, the percentage of people voting in presidential elections, the percent of people who are members of civic groups and associations, and the percentage of volunteers. In Table 17, we report the simple correlation coefficients between VCM cooperation and some of the alternative social capital measures, both averaged out at the session level.

We find that participation in volunteer work in the community is highly correlated with the decision to contribute to the group account in the VCM experimental setting. Also, voting behaviour in presidential elections and membership in civic groups are associated with cooperation but respectively only for the first and the second rounds. This is consistent with the hypothesis that voting behavior may reflect pre-game values and preferences whereas volunteering may be associated with communication skills and social interaction abilities which are crucial for determining individual behaviour in round 2. Interestingly, the correlation with the self reported trust measure is the lowest. Voting in the local election and perception of cooperation in the community also show low correlation with the level of cooperation.

**Figure 4. Average level of cooperation in the group account in the first round and alternative measures of social capital**



**Table 17. Determinants of the decision to contribute in the group account (simple correlations between group averages)**

	Round 1	Round 2
Membership in at least one organization	0.535***	0.483***
Participation in neighborhood decisions	0.667***	0.501***
Voluntary work in the neighborhood	0.594***	0.61***
Vote Local Elections	0.372**	0.259
Vote Presidential Elections	0.647***	0.413**
Trust	0.207	0.295
Trust (index 0-2)	0.576***	0.43**
Perception of cooperation in the community	0.399**	0.294

\* Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

In Table 18, we explore the association between individual (rather than session aggregate) cooperative behaviour in the VCM game and other possible measures of social capital at the individual and session level, while conditioning on various observable variables. The table reports the coefficient on a given social capital measure in a probit regression where the individual behaviour in the VCM game is explained by several controls and that particular ‘social capital’ variable. The first column refers to the decision to contribute to the group account in Round 1, while column 2 refers to the behaviour in Round 2. The same controls as those in the fourth column of Table 5 and in the third column of Table 8 are used, respectively for Round 1 and 2.

**Table 18.**  
**Determinants of the individual decision to contribute in the group account (multivariate)**

	Round 1	Round 2	
Individual	Membership in at least one organization	-0.032	0.052
	Participation in neighborhood decisions	-0.002	-0.016
	Voluntary work in the neighborhood	-0.021	0.026
	Vote Local Elections	-0.025	0.004
	Vote Presidential Elections	-0.048	-0.047
	Trust (index 0-2)	0.005	0.02
	Perception of cooperation in the community	0.002	-0.049*
Session Average	Membership in at least one organization	0.363***	-0.10
	Participation in neighborhood decisions	-0.039	-0.304
	Voluntary work in the neighborhood	-0.092	1.234**
	Vote Local Elections	-0.064	-0.361*
	Vote Presidential Elections	0.063	-0.398
	Trust	-0.274*	-0.552*
	Perception of cooperation in the community	0	-0.302

\* Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

We find that only few of these alternative social capital measures (membership of organization and participation in common work in the neighborhood) are good predictors of individual cooperation. Almost all of them seem to explain individual cooperation in the game much better when averaged at the session level. For instance, the percentage of players being member of social organizations in the session is a more informative predictor of the individual choice of cooperating in Round 1 than whether the player himself is or not a member of a social organization.

These findings are consistent with our previous analysis suggesting that group conformation is relevant in determining the individual behaviour in the VCM game, apparently even more than individual characteristics. Effectively, the experiment is designed in such a way that, independently of a player's social preferences, individual payoffs of cooperation are fully defined by the social preferences of the other players in the group. Under these circumstances, the fact that other players show visible characteristics, such as being member of an organization or being a volunteer in the community, may be perceived as these players have pro-social concerns, and that is a strong incentive for individual cooperation. Also, especially for Round 2, these results may also suggest that, in order to enforce collective agreements towards cooperation, a certain "critical mass" is required in the group which guarantees that a number of players commits to the social optimum.

In addition to standard measures of social capital we also check the correlation between our VCM social capital measure and the connectivity indexes we presented in Table 12. The results are reported in Table 19.

We find that individual social connectivity measures are not associated with individual cooperative behaviour. On the contrary, again, when we calculate a group average measure of connectivity we find high correlation with individual cooperative behaviour. The average connectivity index is a measure of how “filled” is the network matrix in the session. If every player knew every other player in the group (i.e. there is no empty cell in the network matrix) the index would be 1.<sup>25</sup> Our analysis shows that a 0.1 increase in the group average connectivity index would be associated with a 9.3 percentage points increase the individual probability of cooperation in the Second Round. It is interesting that the correlation between this average group connectivity index and individual cooperative behaviour in the VCM is higher for Round 2, when communication between players is allowed, showing that in relatively more “connected” groups it is easier to reach agreements towards the “common good”.

**Table 19. Determinants of the individual decision to contribute in the group account for each round (multivariate)**

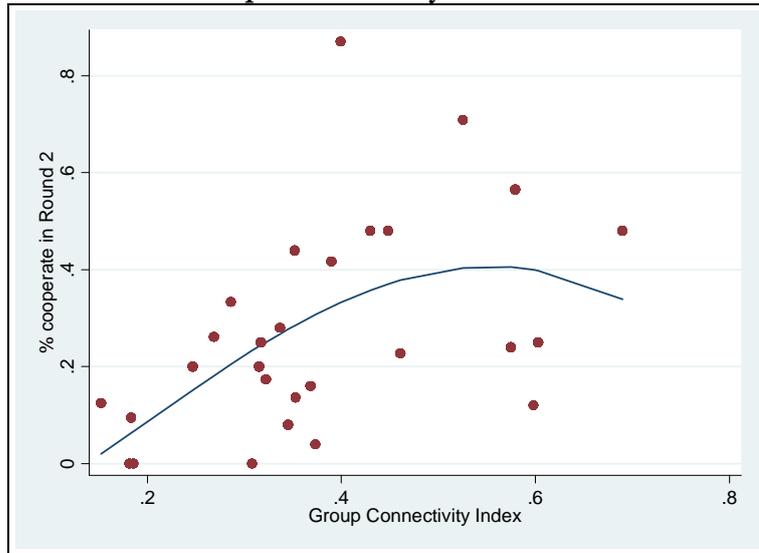
	<b>Round 1</b>	<b>Round 2</b>
% relatives in the session	-1.209	-0.709
% friends in the session	-0.162	-0.17
% acquaintances in the session	0.009	-0.033
% connected in the session	-0.006	-0.047
<b>Group Average Connectivity Index</b>	<b>0.215*</b>	<b>0.841***</b>

\* Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

Figure 5 shows that a positive and clear relation exists between Group Connectivity Index and average group contribution in Round 2.

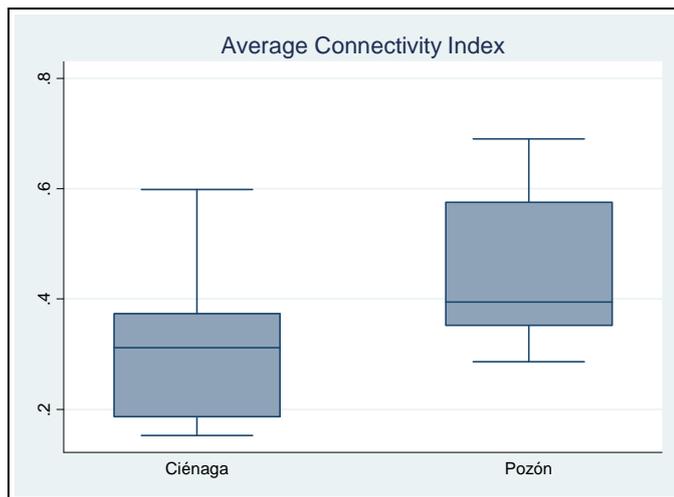
<sup>25</sup> On average the index has a value of .38, which means that 38% of the one-to-one relationships in the group happen between relatives, friends or acquaintances.

**Figure 5. Average contribution to the group account in round 2 vs. Group Connectivity**



Finally, Figure 6 shows that the average connectivity index is significantly higher for the 14 groups that participated in the experiment in *El Pozón* (where the network matrix is “filled” on average at 45%) than for the 14 sessions played in *Ciénaga* (where the network matrix is “filled” on average at 31%). This might be a suggestive explanation of the high cooperation rates observed in *El Pozón*. The positive effect of FA on social capital might be strictly associated to its capacity to promote the creation of networks amongst beneficiary women.

**Figure 6. Group Connectivity Index by Neighborhood**



## 7. Conclusions

In this paper we have proposed a new measure of social capital, constructed by using experimental games played by the representative of poor households from two poor neighborhoods in Cartagena, Colombia. The game, a version of a VCM game, is designed so that individuals face a strong private incentive to deviate from the social optimum. Our measure of ‘social capital’ in a given group is the percentage of individuals who ‘resist’ this temptation.

The main result we find is that our measure of social capital is much higher in the neighborhood where the conditional cash transfer program *Familias en Acción* has operated for over two years than in a similar neighborhood where it had not yet started when the game was played. While it is possible that the marked difference between the two neighborhoods could be due to pre-existing differences, the result is suggestive of the hypothesis that the program, through its social activities, does increase social capital.

To be sure, when we check for differences in observable variables between the two neighborhoods, we do find important differences. The ‘treatment’ neighborhood is considerable ‘poorer’ than the control one. However, the result survives if we control for these observable differences. It also survives when we control for a variety of other factors, including session factors.

Having proposed a new measure of social capital, we also compare it to other more traditional measures, either based on information about social participation of the subjects that participated in the games or on self reported measures of trust. We find some positive correlations between our measure and the more traditional ones. However, the correlation is lowest for the self reported trust measures.

Finally, by calculating a group average measure of connectivity we find high correlation with individual cooperative behaviour. Our findings suggest that group level characteristics affect the individual decision of cooperation.

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