Building Trust? Conditional Cash Transfer Programmes and Social Capital*

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Abstract

In this paper, we propose a measure of social capital based on behaviour in a public goods game. We conducted a public goods game within 28 groups in two similar neighbourhoods in Cartagena, Colombia, one of which had been targeted for over two years by a conditional cash transfer programme that has an important social component. The level of cooperation we observe in

the 'treatment' community is considerably higher than that in the 'control' community. The two neighbourhoods, however, although similar in many dimensions, turn 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. We also compare our measure of social capital with other more traditional measures that have been used in the literature.

I. Introduction and motivation

Conditional cash transfer (CCT) programmes have recently become very popular. International financial organisations, aid workers and policymakers have been promoting them as an effective way of simultaneously reducing short-run poverty and breaking the intergenerational transmission of poverty by providing incentives for the accumulation of human capital.

   A distinctive feature of most CCT programmes, in addition to the fact that grants typically target women, is the fact that the conditions imposed on the beneficiaries often involve social activities, such as attending 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 programmes are only offered to a subset of households in a small locality, this different treatment can introduce conflicts and jeopardise pre-existing relationships. One could therefore expect that these programmes have an effect (positive or negative) on what is often loosely defined as 'social capital'.

   The impacts that CCT programmes have had on schooling, nutritional status and a variety of other outcomes have been well documented.[1] However, whether they have had an effect on social capital remains an object of speculation and the topic of a variety of anecdotes. Even when there have been attempts to evaluate these impacts, typically it has been done using qualitative rather than quantitative methods. This paper's goal is to provide some concrete, hard and quantitative evidence on whether CCT programmes have had an effect on social capital in a specific context by combining survey and experimental methods.

   Familias en Acción (FA) is a conditional cash programme that has become the flagship of the Colombian government's social policy. Started in 2002 in small rural areas, it is now being expanded to large metropolitan areas. The programme has an educational component, conditional on school attendance, and a nutritional component, conditional on health-centre visits

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[1]See Rawlings and Rubio (2003) and Fiszbein and Schady (2009) for a comprehensive review.

as well as attendance at meetings on the part of the mothers. The rural version of the programme has been evaluated (Attanasio et al., 2005) and been found to have effects similar to those found in the case of PROGRESA in Mexico (Skoufias, 2005) and other CCT programmes in rural areas. In particular, FA seems 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 enrolment in secondary school in rural areas.

Because of its mode of operation, the programme also has an important social component. Beneficiary mothers participate in the so-called *Encuentros de Cuidado*, where, in addition to discussing hygiene, nutrition and other health-specific issues, they have the opportunity to talk about different topics or even simply chat together. Conversations with the programme's officials and with beneficiary mothers indicate that these social aspects are indeed an important feature of the programme: 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 arising from the programme might improve social capital.

More specifically, by facilitating group decision making and increasing collective ability to overcome social dilemmas, the social component of the FA programme could generate social capital as defined by Putnam, Leonardi and Nanetti (1993): 'social networks and norms which enhance collective action, generate common benefits and improve individual and group economic outcomes'.

The concept of social capital, as discussed, for instance, in Durlauf and Fafchamps (2005), covers a variety of ideas. On the one hand, social capital is associated with a set of values and motivations and a preference system that inform interactions amongst individuals in a pro-social manner, such as altruism, trust and reciprocity. From a more institutional perspective, social capital has been defined as set of underlying community networks that can be used by individuals for private or public benefit (Cárdenas and Jaramillo, 2007, p. 5). Social capital could then be considered as the most effective means of internalising externalities by agreements on who can produce externalities for whom (Robison and Siles, 2002). Unfortunately, it is difficult to measure these types of outcomes concretely.[2]

The first aim of this paper is to construct a quantitative measure of social capital. We then use this measure to estimate the impact that *Familias en Acción* has had on social capital by comparing two different situations, one in which the programme has operated for about two years and one in which the programme has not yet started. Comparing our measures of social capital

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[2]However, several studies have identified useful proxies for social capital, using different types and combinations of qualitative, comparative and quantitative research methodologies (see Woolcock and Narayan (2000)).

in these two situations can be a simple way to test the hypothesis that the programme has developed social capital where it has operated. This hypothesis is obviously relevant for the specific programme and context that we are analysing, but it also has a more general salience. Similar features characterise many CCT programmes, starting with the Mexican PROGRESA/*Oportunidades*. In addition, CCT programmes have become extremely popular in Latin America in the last 10 years, with some type of CCT programme operating in Argentina, Brazil, Chile, Ecuador, Honduras, Jamaica and Nicaragua. Results on *Familias en Acción* would therefore be relevant for other situations as well. While some qualitative studies of the effects of conditional cash transfer programmes on social capital do exist,[3] we are not aware of any comprehensive quantitative analysis.[4]

The exercise we propose is, of course, not without difficulties and we will need to spell out some caveats. While the measurement of social capital using experimental games is not novel,[5] this paper is one of the first to use a public goods game for such a purpose. Whether the behaviour we observe in our game effectively measures social capital or some other aspect of individual preferences is debatable. 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.

As for the ability to measure the impact of FA on social capital, we have to deal with the usual identification issues. For the inference about the link between the programme and our measure of social capital to be legitimate, it is necessary that the two situations compared are, indeed, comparable. As in the standard evaluation setting, it is necessary to assume that the context in which the programme does not operate can be used as a counterfactual for the context in which the programme does operate. We will discuss the plausibility of such an assumption in our specific context later.

The rest of the paper is organised 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 CCT programme 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 is performed. The details of the measurement tools used are explained in Section IV. In Section V, we present our results on the effect of FA on social capital. In Section VI, we discuss alternative measures of social capital and relate them to the one we propose. Section VII concludes the paper.

[3]For instance, in the case of PROGRESA, see Adato (2000).

[4]Although Pellerano (2009) looks at evidence from Colombia on the impact of CCT programmes on social participation and membership of civic organisations.

[5]See, for instance, Karlan (2005).

II. The effects of a conditional cash transfer programme on social capital

Our main purpose is to examine, by combining survey and experimental methods, the effect of a social intervention on the behaviour of individuals and groups and on their ability to obtain better social and economic outcomes. There are two main difficulties in rigorously testing the hypothesis that CCT programmes increase social capital. The first lies 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.

1. Measuring social capital

There is now a large literature, covering several disciplines, that discusses social capital.[6] Without going into the substance of the issues, it is widely recognised that measurement of social capital is a difficult and yet important matter. The World Bank promotes a standardised questionnaire to be implemented possibly within a large survey.[7] And yet it is not clear how well this questionnaire measures social capital. For that reason, we have followed a different approach, based on an experimental game that is conducted in the field and whose outcome depends on the ability of individuals to trust each other and act as a group, possibly assuming the individual cost of public goods provision (i.e. internalising externalities). The idea behind the application of the game 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 the amount won depends on the ability of the subjects to act as a group and internalise externalities.

The approach of using games to measure social capital is not novel: Karlan (2005), for instance, has used the concept of trust and a public goods game to measure social capital in Peru. We choose a particularly simple version of the public goods game from a set of experiments that have been developed over the last few years, within a variety of evaluation initiatives, to obtain measures of social capital. These games have been applied in a variety of different situations, both urban and rural, in Colombia.[8,9] All these

measures are based on experimental games applied in the field, rather than in a laboratory (Harrison and List, 2004). Here, we propose a version of a public goods game called the voluntary contribution mechanism (VCM), which we describe in detail below. This game is one of the experimental methods that have often been 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 for all members increase with the number of contributors. The game is designed so that while the total return to the investment in the group account is higher than the return of the private account, there is no incentive to invest in the former because of the higher individual pay-off that can be obtained from investing in the latter. The dominant strategy is not to contribute at all, undermining the social outcome. If everyone in the group invests the token in the private account, the group will be worse off than if all the members invest in the public account, which constitutes the social optimum.

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 internalise, at least in part, the externality that is built into the game.[10] At the same time, there seems to be a considerable amount of heterogeneity in the abilities of different groups to solve this kind of problem. The possibility of cooperating within a group is determined by multiple factors such as repetition, communication, punishments or rewards, and inequality in the payments. For this reason, this set-up seems particularly attractive in devising a measure of social capital.

The incentives to invest in the group account are given by characteristics of the design but, overall, by the individual motivations concerning the group's well-being. Individual attributes such as altruism, trust, social distance from the other members (Cárdenas, 2003), fairness (Rabin, 1993), reciprocity (Andreoni, 1988 and 1995; Bowles and Gintis, 2004), a sense of affiliation as a member of a common group and sympathy towards others in the group (Kurzban et al., 2001) determine social cohesion in a group and

have been invaluable. We have experimented with risk-pooling games, trust games and public goods games, and we have combined the information from these games with information collected in detailed surveys.

[10]Many of the VCMs reported in the literature afford the possibility of investing a fraction of the initial endowment, while our game forces a 0/1 choice, making the explanation much simpler. In the literature, average contributions to the public good are in a range of 40 to 60 per cent of the group optimum (Ledyard, 1995; Camerer and Fehr, 2003; Cárdenas and Carpenter, 2008). For a detailed survey of these results, see in addition Croson (2007).

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 (Cárdenas and Carpenter, 2008), concerns for social reputation, social reciprocity[11] (Bowles and Gintis, 2004) and group identification enforce the group's interests over the individual and lead to the dilemma being overcome and a higher level of contribution being attained (Gunnthorsdottir, Houser and McCabe, 2007).

The considerations in the previous paragraph make it clear that the concept we are trying to measure is a multifaceted one, which is affected by multiple factors. From a policy point of view, one is often interested in social capital because it might be perceived to affect the ability of a group or a society to provide public goods. It was therefore natural to adopt the behaviour in a public goods game as one possible measure of social capital. However, we do recognise that our measure, which focuses on deviations from a unique Nash equilibrium, might be interpreted as reflecting other factors, such as the prevalence of altruism. Similarly, the game behaviour may also be associated with the degree of trust (and risk aversion) of a player, in so far as he or she must rely on other players' decisions for the social optimum to be achieved. Other aspects of social capital could be captured, instead, by different games. One possibility is to interpret social capital as facilitating coordination problems. In this case, one could devise games with multiple, Pareto-ranked equilibria and define social capital as the ability to coordinate on superior equilibria.[12]

As detailed below, the VCM game in each session is played in two rounds. The subjects first play the game individually and privately, without being able to communicate with other players. After the first round (but before its results are revealed), they are given the opportunity to talk and discuss strategies for the second round. Finally, the second round is played, again individually and privately, before the results of both rounds are announced. We use two different measures of social capital. The first is simply the proportion of players in each round who contribute to the public project. The second is the change in this proportion between the two rounds. This second measure aims to capture the effects of communication on social outcomes. Notice that while the literature reports, on average, an improvement between the two rounds, in principle the proportion of individuals contributing to the public good could decline as well as increase (Cárdenas and Carpenter, 2008). If, for instance, in the talks it emerges that in the first round a big majority of players have played 'private', those who

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[11]Defined by Carpenter and Matthews (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)'. Cárdenas 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'.
[12]See Attanasio et al. (in progress).

played 'public' might realise that this is not an optimal strategy. On the other hand, communication is a mechanism that gives group members the chance to make explicit commitments and promises about what they will do (Isaac and Walker, 1988a); it 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 optimum social outcome if individuals are involved in an ongoing relationship, are able to identify each other and have information about past behaviour from others in the group (Cárdenas and Ostrom, 2004; Bochet, Page and Putterman, 2006).

Given the conceptual issues we have discussed in using behaviour in a public goods game as a measure of social capital, later we compare our measure with more traditional ones that have been used in the literature. For this purpose, we use data from an interview administered to the participants of the game. In this survey, among other things, we ask questions on issues that have been suggested as possible measures of social capital. For instance, we ask whether individuals participate in certain social activities (such as voting) and whether they 'trust' their neighbours. We also include a set of questions on membership of social groups and organisations.

2. A quasi-experimental approach

In social sciences, whenever one is interested in measuring the effects of a social programme on a given outcome, one faces the problem of the construction of appropriate counterfactuals. The outcome that would occur in the absence of the programme is, by definition, unobservable. Quasi-experimental methods try to identify these counterfactuals by comparing the outcome of interest observed for individuals exposed to the programme with the outcome measured for 'similar' individuals not exposed to the programme. By 'similar' is usually meant that, in the absence of the programme, exposed individuals would have *on average* the same outcome as those with whom they are compared. When a large sample is available for studying a given programme and when the programme 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 are studying, we have neither a large sample (effectively, we are considering two neighbourhoods) nor a random allocation of the programme. However, we still claim that the comparisons we present are interesting. First, although not random, it seems that the allocation of the programme among the units we will be considering was not driven by specific pre-existing differences between them. Second, the existence of differences in observable variables can be tested and, if such

differences are indeed present, they can be controlled for. In this case, the inference one would make about the effects of the programme would depend on whether the observable variables summarise 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 programme, so as to be able to control not only for observable variables but also for unobservable factors that do not change over time and that affect the outcome of interest in an additive fashion.

Having said all this, it is clear that our results can only be interpreted as the impact of the programme we are studying on our measure of social capital if we are willing to assume that the two neighbourhoods are comparable, at least after controlling for the observable variables we consider. As in any matching approach, our identification strategy requires that, after conditioning on the observables, a 'control' neighbourhood can be used as a counterfactual for the 'treated' one.

III. *Familias en Acción*: institutional details of a conditional cash transfer programme

Since its inception in 2002, *Familias en Acción* – a conditional cash transfer programme inspired by the Mexican PROGRESA – has become the flagship programme of the Colombian government's social policy. The programme, which targets the poorest 20 per cent of Colombian households,[13] has two main components: a nutritional component aimed at households with children under the age of 5 and an educational component aimed 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 in the so-called *Encuentros de Cuidado*, meetings in which a variety of issues are discussed and during which the mothers elect a representative who will be in charge of organising several of the programme activities. The nutritional grant, roughly equal to US$25, targets households with at least one child under 5 and is independent of the number of children in the household. The educational grant is available to households with school-aged children and is conditional on school attendance. Each child in primary school entitles the household to about US$8 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 in a variety of activities; they get to know each other and meet much more regularly than they would

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[13]In Colombia, most welfare programmes are targeted using the so-called Sisben score, a poverty indicator which is updated periodically. On the basis of this score, households are assigned to one of six categories. *Familias en Acción* targets level 1 of Sisben, which is the poorest category.

do otherwise. These activities take place in the *Encuentros de Cuidado* and during health-clinic visits.[14]

FIGURE 1

Map of Cartagena

Neighbourhood:
Ciénaga de la Virgen
Localities:
- Líbano
- Boston
- Foco Rojo
- Ricaurte
- Candelaria
- Chiquinquirá
- 11 de Noviembre
- Fredonia
- Las Américas
- Nuevo Paraíso
- Olaya Herrera
- Rafael Núñez

Neighbourhood:
El Pozón
Localities:
- 1 de Mayo
- 19 de Febrero
- El Pozón
- La Paz
- Corazón de Jesús
- Los Lagos
- Tamarindos
- Minuto de Dios
- 14 de Febrero
- Guarapero
- La Conquista
- La Estrella
- Miramar
- La Unión
- La Islita
- Nueva Cartagena
- San Nicolás
- Santa Eduviges
- Los Ángeles
- Central

Source: Instituto Geográfico Agustín Codazzi (IGAC).

[14]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 programme to urban areas. When this decision was taken, FA officials identified a few urban areas in which to pilot the programme. In particular, it started in some poor neighbourhoods of Soacha (a large satellite city of Bogotá), in some *comunas* in Medellín and in a neighbourhood of Cartagena called El Pozón.

When starting the Cartagena pilot in the autumn of 2005, according to FA officials with whom we talked, the programme administration was undecided among three neighbourhoods of Cartagena – El Pozón, Nelson Mandela and Ciénaga de la Virgen. In the end, El Pozón was chosen because of contingent events (some floods that created temporary problems in that particular neighbourhood). At the time of our experiment, the programme had been developed in El Pozón but nowhere else in Cartagena. In what follows, we base our evaluation strategy on a comparison between El Pozón and Ciénaga de la Virgen. The reason for choosing Ciénaga rather than Nelson Mandela was that, according to FA officials, the social fabrics of these two *barrios* were very similar. Indeed, the two neighbourhoods are geographically close to each other (see Figure 1).

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 applications to the programme was launched in every municipality of the country, regardless of their population size. The government was hoping to raise the number of FA beneficiaries to 1.5 million households by the end of the year. In this context, the programme was also being rolled out in the poorest neighbourhoods of Cartagena, including Ciénaga. The data-collection strategy was designed so that *potential* beneficiaries in the control neighbourhood would receive the programme shortly after the game was implemented.

The planned expansion of the programme to the control neighbourhood, Ciénaga de la Virgen, has two advantages. First, it has been possible, with the help of FA officials, to identify the *potential* beneficiaries in Ciénaga. Second, when the programme is implemented in both neighbourhoods, it will be possible to run a similar experiment, this time in both, and to collect similar data, in order to control for fixed unobservable effects.

IV. Experimental set-up

In each of the two neighbourhoods, we played 14 sessions of a VCM. In each session, we aimed to include 25 people recruited in the neighbourhoods among the beneficiaries (in El Pozón) and potential beneficiaries (in Ciénaga) of *Familias en Acción*.[15] To minimise 'cross-talk' and its effects –

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[15]For additional information about the instruments, see the online appendix published at http://www.ifs.org.uk/docs/app_vcm_intstruments.pdf.

participants talking about the experiment to future players who will participate in subsequent sessions[16] – the 28 sessions in El Pozón and Ciénaga were conducted simultaneously from 11 July to 14 July 2007. We had a total of 676 players – 342 in El Pozón and 334 in Ciénaga – and most of the participants (99 per cent) were women. Among the participants in Ciénaga, there were seven men. The design for the study involves 25 people per session.[17]

The participants were invited to come to the local public high school. Upon arrival, they were given an identification number randomly and seated in a semi-circle in a classroom. Each player received an endowment of one token that could be invested either in a private account or in a group account. The individuals' private decisions were made simultaneously and without discussion with anyone in the group. The earnings were calculated in the following way. If the player chose to invest in the private account, the token was converted to \$5[18] and would be given entirely to her. In addition, regardless of how she invested her own token, each player would receive \$0.40 for each token 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 would be \$5+(\$0.40×Sum of tokens invested by the group). On the other hand, if the player chose to invest her token in the group account, she would receive \$0.40 for each token invested in the group account by her and by the rest of the group. In this case, her total earnings at the end of the round would be \$0+(\$0.40×Sum of tokens invested by the group). Each player made her private decision by selecting a card that said whether she was going to invest her money in the group account or keep it for herself (i.e. in the private account). The experimenter then collected the 'decision cards', totalled them up (multiplying by \$0.40 where appropriate) and credited the relevant amounts to each player. The relevant amounts, however, were 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 had to decide independently and privately where to invest her token. The second round was a repetition of the first, except that the players were allowed 10 minutes' discussion before making their private, anonymous decisions simultaneously. 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 were discussing with the other

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[16]See Cárdenas and Carpenter (2008).

[17]Unfortunately, we did not have this number of players in 14 sessions because some subjects failed to show up. However, the average session size was 24 people and there was no significant difference in session size between the control and target neighbourhoods.

[18]Units in thousands; thus \$5 means COL\$5,000 (US\$2.56, according to the official exchange rate at that date TRM: US\$1=COL\$1,951.84 (monthly mean average for July 2007, http://www.banrep.gov.co)).

players or when they were playing the second round. At the end of the session, however, the totals but not the individual strategies were announced. The players were paid in cash privately at the end of the session after taking a snack. The pay-off resulting from both rounds was paid together with a show-up fee of $2 to cover the transport costs of each participant.

This experiment was designed to set up a situation for 25 people where there is a social dilemma, illustrated in Figure 2. This figure shows the two possible individual outcomes (playing public and playing private) as a function of the number of individuals j who 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, rather than $5, no matter what the others do. Therefore, each player would want to 'free ride' on the others for 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

FIGURE 2

The basic structure of the dilemma
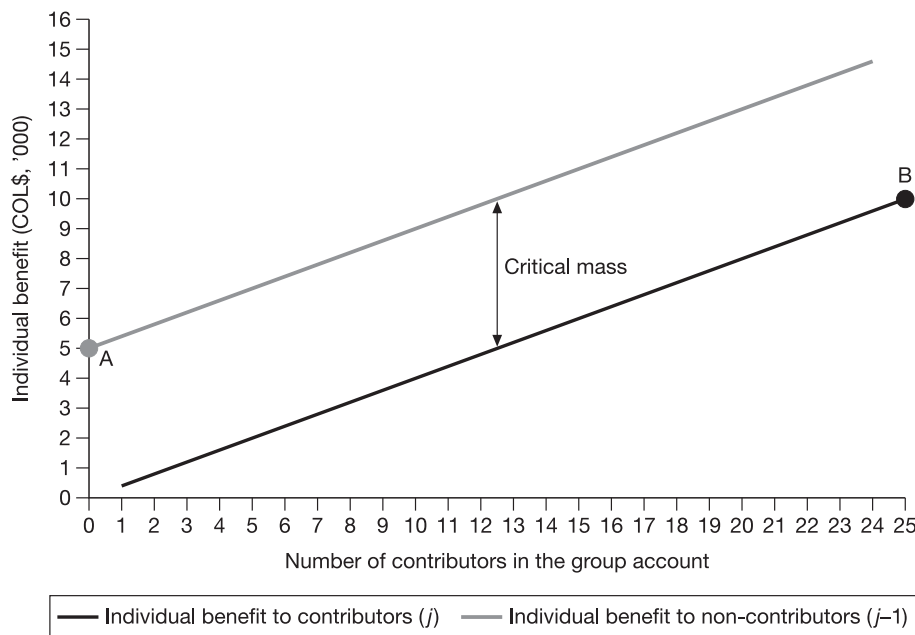
Experiment design: This figure shows the two possible individual outcomes (playing public and playing private) as a function of the number of individuals j who contribute to the group account. The dominant strategy for the $j–1$ player is to choose not to invest the token in the group account because each token contributed yields only $0.40 to its contributor, rather than $5, no matter what the others do. Therefore, each player would want to 'free ride' on the others for the benefits of the group account, and the Nash equilibrium is that everyone invests in the private account (point A). The social optimum where the group would be best off is that everyone contributes (point B).

(players) × \$5 (private account return) = \$125. The social optimum where the group would be best off is for everyone to contribute (point B) as each token contributed yields 25 (players) × \$0.40 (group account return) = \$10 to the others at no cost to the individual. In this case, the group earnings would be 25 (players) × \$10 (individual benefit of the group account) = \$250. Notice that the critical mass is 13: it is necessary for at least 13 players to contribute to the public account for a contributor to this account to earn at least the same as in the Nash equilibrium where everybody invests her token in the private account. If the group were smaller than 25 players, the critical mass would be more difficult to achieve.

We complemented 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 collected information about basic demographic variables as well as information about the game, household data, political attitudes, socio-economic vulnerability and social capital measures such as membership of organisations and trust. This survey yielded some insights into the individual characteristics that could affect the decision about contributing (for example, volunteerism, participation in community activities, leadership and attendance at civil society groups) and also provided information for examining the external validity of our results. Participants in the 'treatment' neighbourhood were also asked a question about their attendance at the *Encuentros de Cuidado*. In the survey, 97 per cent of the mothers confirmed their attendance at these meetings.[19]

The survey ended with a module that aimed to construct a 'networks map' for each session, asking the subjects questions about their relationship to other participants. In particular, in the networks questionnaire, we asked each participant her relationship to each other player in the group ('How do you consider person Y?') using three categories: relatives, friends and acquaintances. The network information allows us to measure the degree of connectivity among the players in each session.[20] We also asked whether the player considered there to be a leader in the group and, if so, who it was (no more than one person could be mentioned). This variable provides us with information about the presence of leaders and is useful in determining their potential role in the game outcome.

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[19]According to administrative data, about 50 per cent of mothers do not attend the *Encuentros de Cuidado*. This pattern could be explained by the fact that the programme'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.

[20]A referee suggested asking the subjects about their acquaintances' trustworthiness. This information would have given us a more accurate measure of social capital. There were two reasons we only obtained a measure for connectivity. First, we replicated the same experimental and survey design that was conducted in the FA's first and second follow-up evaluations in rural areas. Second, we were constrained by time logistics. However, we will consider collecting a trustworthiness measure in future studies.

Taking into account the characteristics of the social networks in the group is an important feature of our analysis. The social networks' structure determines the degree of social cohesion in a group and the ability to overcome the costs of collective action. In the VCM experiment, networks affect players' information about others' characteristics,[21] their willingness to cooperate and the transaction costs attached to their decisions. Also, the structure of networks affects players' willingness to communicate with others and their ability to do so in an effective and organised way to obtain the optimum social outcome (Cárdenas and Jaramillo, 2007). If there is no social network (i.e. all participants are unknown to each other), the cost of effective communication could be higher.

V. Results: do CCT programmes build social capital?

In this section, we present our estimates of the impact of *Familias en Acción* on our measures of social capital. We start with unconditional comparisons. We then condition on a variety of variables that could explain observed differences in measured social capital between the two neighbourhoods.

1. Unconditional comparisons

In an attempt to identify the effects of FA on our measure of social capital, we start by comparing contribution rates to the public project in the two neighbourhoods. The results are summarised in Table 1. The overall contribution rate is quite low, at 20 per cent. This means that, on average, only five players per session contributed to the public good. At this level, the contributors to the public good obtained 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 neighbourhoods is remarkable: while only 6.6 per cent 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 was 33 per cent. This difference is significant at the 1 per cent level. Here and in what follows, standard errors are clustered at the session level.

The average levels of cooperative behaviour in Round 1 and in Round 2 are highly correlated (see Figure 3). In the second round, in both neighbourhoods, there is a movement towards the social optimum: contribution rates increase by 5.3 percentage points in El Pozón and by as

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[21]Cárdenas and Jaramillo (2007) applied a similar design with larger groups and found evidence that the players infer from their immediate neighbourhood information about the global features of the network.

TABLE 1

Descriptive statistics and mean comparisons

	El Pozón	Ciénaga	Total
Sessions			
Number of participants	342	334	676
Number of sessions	14	14	28
Size of the group for the smallest session	22	21	21
Size of the group for the largest session	28	25	28
Average size per session	24	24	24
Average gain without show-up fee (COL$'000) ***	13.37	11.04	12.22
First round			
Average percentage contributing per session ***	33.04	6.59	19.97
Percentage of sessions with no contribution **	0.00	29.94	14.79
Median percentage contributing per session	31.64	4.35	16.00
Maximum percentage contributing per session	66.67	24.00	66.67
Average gain without show-up fee (COL$'000) ***	6.56	5.30	5.94
Efficiency index (%)[a] ***	67.20	55.53	61.43
Second round			
Average percentage contributing per session ***	38.30	15.87	27.22
Percentage of sessions with no contribution *	0.00	21.26	10.50
Median percentage contributing per session	33.33	17.39	24.00
Maximum percentage contributing per session	86.96	48.00	86.96
Average gain without show-up fee (COL$'000) ***	6.80	5.74	6.28
Efficiency index (%)[a] ***	69.70	60.02	64.92

[a]The efficiency index is calculated for each group as the sum of the gains of people who decided not to contribute and the gains of people who did decide to contribute over the gains in the group if everyone in the session contributed – in other words, the real size of the cake over the size of the cake if everyone had contributed.

Notes: Difference between neighbourhoods significant at 10 per cent (*), 5 per cent (**) and 1 per cent (***). All inferences are performed by computing standard errors that are clustered at the session level. Median and maximum percentage contributing per session were not tested.

much as 9.3 percentage points in Ciénaga. The improvement is statistically significant in both El Pozón and Ciénaga. While the point estimates indicate that communication is more effective in Ciénaga than in El Pozón, this difference is not statistically different from zero, although this could be due to the relatively small sample size of 14 sessions in each neighbourhood. And even after the larger improvement in Ciénaga, the contribution rate remains much higher (and significantly so) in El Pozón.

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 (Cárdenas and Carpenter, 2008).[22] In Colombia, an almost

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[22]As mentioned in footnote 10, a direct comparison with many of the games reported in the literature is problematic, as in most of them participants are allowed to contribute a fraction of their endowment to the public good while we impose an all-or-nothing choice. However, reported average contributions range

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 programme. The results, analysed in Attanasio and Phillips (in progress), indicate a contribution rate of around 35 per cent, not too different from that observed in El Pozón.

Taken literally, the results imply that the programme – if that is the only difference between the two neighbourhoods being considered – has a very strong effect on social capital, or at least on our measure of social capital. Below, we discuss extensively the robustness of this result and its interpretation.

As for the *change* between the two rounds, we find that, although the level of cooperation increases in Ciénaga more than in El Pozón, this difference is not statistically significant. Moreover, as we have very limited information on the nature of the discussions that happened between the two

FIGURE 3

Contribution rates to the group account in Rounds 1 and 2
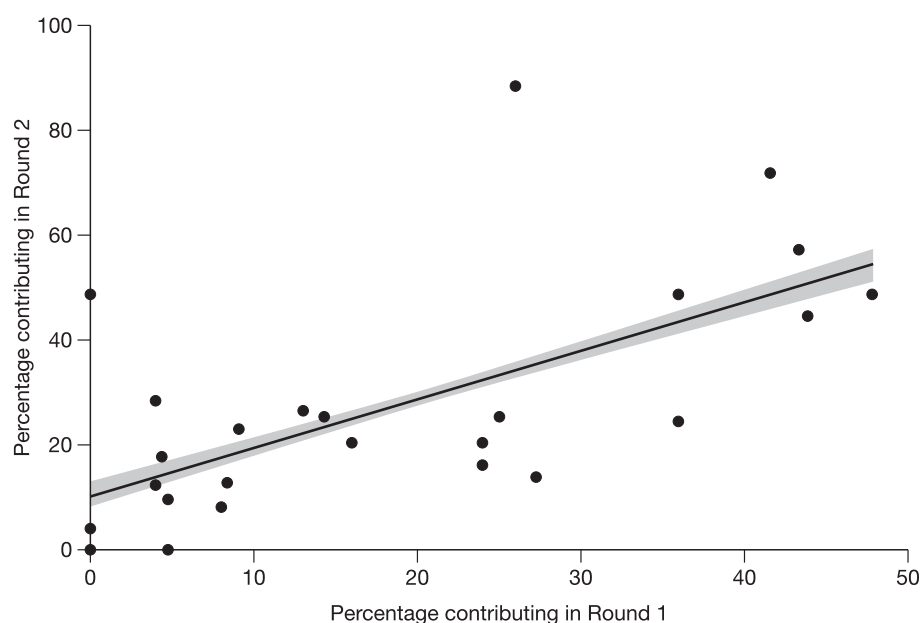
Notes: The line depicts a linear fit based on the ordinary least squares (OLS) regression of percentage contributing in Round 2 on percentage contributing in Round 1 and a constant; the 95 per cent confidence interval is shown by the shading. One session in El Pozón had a level of cooperation in the first round of 66.7 per cent; this outlier was excluded in the estimation.

from 23 per cent of endowment in Peru (Henrich and Smith, 2004) to 37 per cent in the US (Harrison and List, 2004), 52 per cent in Russia (Gächter, Herrmann and Thöni, 2004), 53 per cent in Zimbabwe (Barr and Kinsey, 2002) and 58 per cent in Kenya (Ensminger, 2000).

rounds, it is difficult to interpret what happens in the second round. It should be stressed that, while the discussion was completely free and unstructured, the participants still did not know the outcome of Round 1 when they were playing Round 2. There was therefore no way to confirm statements made by various players during the discussions. Both from a theoretical point of view and from the available evidence, communication can have different effects on the level of cooperation. It is, for instance, possible that discussion leads to a convergence towards the Nash equilibrium (as, for instance, observed in a variety of laboratory repeated games of this kind; see Fischbacher and Gächter (2009)). A possible interpretation of the point estimate difference is that in El Pozón, people had already internalised (possibly through their experience in the programme) the benefits of communication or they had already 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.

The facts that the allocation of the programme was not random and that we are only considering two neighbourhoods present 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 programme. To check this possibility, we now turn to the analysis of data from the post-game survey.

2. Characterising and conditioning on observables

In Table 2, we report the means of several variables we observe for the participants as well as tests of significance for the difference between the two neighbourhoods. Unfortunately for our purposes, and to our surprise, important differences between the two neighbourhoods emerge quite clearly.

In particular, players from El Pozón are older on average, less likely to be the head of the household or single, and more likely to be the wife or partner of the household head. Moreover, they are more likely be displaced because of the internal conflict in Colombia and, consistently, they declare to have been living in the neighbourhood on average eight years less than players in Ciénaga.[23] However, there are not significant differences in the level of education between players from El Pozón and those from Ciénaga.

In addition to the individual-level variables, the survey also contains household-level variables. The players in El Pozón seem considerably less poor, on average, than those in Ciénaga. They are more likely to own the house where they live, to be connected to piped water and to own several

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[23]This result may be due to the fact that in El Pozón, it is easier to contact displaced people through FA operational networks, as they are beneficiaries of the programme. In Ciénaga, this population may be more difficult to recruit because they are usually socially isolated.

TABLE 2

Demographic characteristics of the game participants

	El Pozón	*Ciénaga*
General characteristics		
Female **	100.00	97.90
Age (years) ***	38.04	33.56
Number of years living in the neighbourhood ***	14.49	22.37
Percentage displaced ***	19.11	8.20
Percentage household head **	21.34	30.53
Marital status (percentage)		
Married or civil partnership ***	76.90	62.87
Single ***	5.56	11.68
Education level (percentage)		
None (level 0)	2.05	4.19
Primary incomplete (level 1)	18.12	18.56
Primary complete (level 2)	13.45	13.77
Secondary incomplete (level 3) *	37.43	30.24
Secondary complete (level 4)	23.98	25.45
More than secondary complete (level 5) *	4.97	7.78
Dwelling characteristics		
Number of people per room	3.22	2.88
Percentage with dirt floor ***	24.26	41.01
Percentage owning own house ***	82.74	58.68
Time to reach nearest health centre (minutes)	28.09	32.31
Public services (percentage)		
Water by pipe ***	94.73	76.94
Sewer system ***	64.32	12.57
Phone ***	9.64	26.64
Assets (percentage)		
Cell phone ***	86.25	67.06
Bicycle **	21.92	14.37
Colour TV *	80.70	74.55
Washing machine ***	23.68	13.77
Sound player ***	39.76	25.14
Income variables		
Percentage unemployed ***	2.92	10.77
Percentage with access to credit	67.83	66.76
Percentage with access to formal credit	21.05	22.20
Percentage with food insecurity	9.64	9.88
Per-capita monthly income (US$) ***	24.68	21.78

Notes: Difference between neighbourhoods significant at 10 per cent (*), 5 per cent (**) and 1 per cent (***). All inferences are performed by computing standard errors that are clustered at the session level.

durables and other assets, and they are 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.

Clearly, some of the differences observed in Table 2 could have been induced by the programme 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 neighbourhood. For instance, asset tenure and monthly income may clearly be 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 programme, 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 1 are indeed a consequence of the programme: many of the differences reported in Table 2 in all likelihood pre-dated the arrival of the programme. It is therefore possible that the level of social capital was also different in the two neighbourhoods.

To shed some light on this issue, we condition on a variety of observable variables, at the individual and household levels. As we are attempting to control for the possible existence of pre-programme differences in social capital, we limit ourselves to variables that are unlikely to have been affected by the programme. In addition to these variables, we also consider session-level variables. In other words, we use a matching approach: our identification assumption is that, conditional on the observable variables, the treatment and control neighbourhoods are comparable.

In Table 3, we report results of a probit regression where we model the probability that an individual contributes to the group account in the first round of the VCM game as a function of several observables and the effect of FA (shown by a dummy that indicates that the player is from the 'treatment' neighbourhood, El Pozón). The various specifications we report in the various columns differ in the types of variables we control for. We will discuss the results for the second round in Section V.3; here, we concentrate on the first round.

Notes for Table 3

Each regression is based on 666 observations. There are additional controls which are not shown in this table: 1 if player is head of household; player's age; 1 if player is unemployed; 1 if player owns her own house; number of rooms in house; 1 if player is displaced (self-declared); 1 if player belongs to top quintile of per-capita income; 1 if player has a phone; and 1 if player did not understand the instructions. They are generally not significant.

* significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent.

Marginal effects reported. Robust standard errors, clustered by session, in parentheses after probit estimation.

TABLE 3

Programme's impact on the cooperative decision: Round 1

Dependent variable: 1 if player contributed to the group account in Round 1

Independent variables	Spec. 1	Spec. 2	Spec. 3	Spec. 3a
El Pozón dummy	0.283***	0.283***	0.102**	0.106
	(0.072)	(0.068)	(0.045)	(0.086)
Basic controls – participant's characteristics				
Married or civil partnership	0.068**	0.068**	0.053*	0.051
	(0.033)	(0.035)	(0.031)	(0.032)
Level of education (0–5)	0.021**	0.020**	0.020**	0.020**
	(0.011)	(0.009)	(0.009)	(0.010)
Household size	0.015**	0.015*	0.016**	0.016**
	(0.007)	(0.008)	(0.007)	(0.007)
House has dirt floor	–0.040	–0.035	–0.035	–0.032
	(0.030)	(0.029)	(0.029)	(0.029)
Number of years living in the neighbourhood	0.001	0.001	0.001	0.001
	(0.002)	(0.001)	(0.001)	(0.001)
Water by pipe	0.126***	0.113***	0.111***	0.110***
	(0.030)	(0.029)	(0.023)	(0.024)
Sewer system	–0.039	–0.041	–0.039	–0.039
	(0.035)	(0.031)	(0.029)	(0.030)
No electricity	0.127	0.098	0.119	0.121
	(0.120)	(0.121)	(0.135)	(0.137)
Session characteristics				
Number of players in session		–0.011	–0.022**	–0.028**
		(0.010)	(0.010)	(0.011)
1 if there is at least one man in the session		0.239***	0.208***	0.164**
		(0.087)	(0.046)	(0.065)
Experimenter 2 (female)		0.015	0.064	0.066
		(0.057)	(0.041)	(0.046)
Experimenter 3 (male)		0.079	0.096***	0.079**
		(0.049)	(0.034)	(0.037)
First session in the day		0.099**	0.126***	0.130***
		(0.043)	(0.046)	(0.044)
Behaviour in Round 1 of previous two sessions[a]		0.407	0.450**	0.308
		(0.267)	(0.181)	(0.238)
Session composition (information within session)				
Average of level of education			–0.080*	–0.103**
			(0.044)	(0.046)
Standard deviation of level of education			–0.245**	–0.285**
			(0.111)	(0.114)
Standard deviation of age			–0.017***	–0.026**
			(0.006)	(0.010)
Standard deviation of number of years living in the neighbourhood			–0.040***	–0.038***
			(0.011)	(0.011)
Average of age				0.008
				(0.010)
Average of number of years living in the neighbourhood				0.006
				(0.010)

[a]Calculated as the mean of the previous two sessions' deviations from the neighbourhood average contribution to the public account in Round 1.

Notes: See previous page.

The first thing to notice is that, across specifications, the effect of the programme is sizeable and significant. According to specifications 1 and 2, the probability of contributing to the group account in the first round is 28.3 percentage points higher in the treated neighbourhood than it is in the control neighbourhood. Indeed, the size of the effect is exactly the same in the first two specifications, where we control for individual and household characteristics (specification 1) and then add experiment and session characteristics (specification 2). This makes us more confident about interpreting the coefficients on the treatment dummy as the effect of FA.

While in specification 1 we only control for individual and household characteristics, in specification 2 we control for session characteristics as well. The number of players in the session determines the structure of incentives underlying the game as it defines the social optimum (Isaac and Walker, 1988b), but it may also affect the ability to coordinate and the effectiveness of communication. An issue that worried us considerably in the field was the possibility that individuals who played in early sessions would 'contaminate' other individuals who were about to enter subsequent sessions, 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 contact was unavoidable. For this reason, we control for the sequence order in which sessions were played in a day and also for results in previous sessions.[24] While we do find these effects to be significant, we would not expect them to affect the size of the treatment coefficient much, partly because they are present in both treatment and control sessions. In specification 2, we also control for the identity of the experimenter. 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 by introducing two dummies.

Finally, in specifications 3 and 3a we control for some indicators of session heterogeneity, with variables such as the standard deviation of level of education, of age and of years living in the neighbourhood. Controlling for these variables decreases the point estimate of the treatment effect substantially, although it is still statistically significant (specification 3). When we also include average age and average tenure in the neighbourhood, which are statistically insignificant, the coefficient on treatment does not change much but it becomes statistically insignificant (specification 3a).

Only four of the 17 structural socio-economic controls that we include in the specifications are significant. We find that more educated players tend to

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[24]Specifically, in order to control for contiguous sessions correlation, we include in specification 3 a dummy for the first session each day and a variable capturing the mean of the previous two sessions' deviations from the neighbourhood average contribution to the public account in Round 1.

cooperate more in the game, as do those belonging to larger families and those married or living with a partner. We also find some evidence that cooperation is positively associated with better economic conditions: according to specification 3, players living in a household with running water are 11.1 percentage points more likely to contribute to the public account in Round 1.

The controls on potential session correlation confirm that a certain correlation, probably induced by contamination, is indeed observed between contiguous sessions: the average contribution rates are higher in the first session of each day and positively associated with the deviation from the mean of the previous two sessions in each neighbourhood. The measured effect of experimenter 2 (relative to experimenter 1) is positive but not statistically significant, whereas the effect of experimenter 3 is positive and significant in specifications 3 and 3a. We have no clear interpretation of this result.[25]

We find that the composition of the group is extremely significant in determining individual cooperative decisions, even in the first round of the VCM game when communication between players was not allowed. First, we find that cooperation is easier in relatively smaller groups. This is somewhat surprising, as the return to investing in the public good is a linear function of the number of players in a session. Second, we observe that in those sessions where at least one man was playing (four out of 28, all in Ciénaga), contribution rates are 16–24 percentage points higher. Finally, we find strong evidence that group heterogeneity reduces the incentives for individual cooperative behaviour.[26] Indeed, in those sessions where players' education, age and length of residence in the neighbourhood are more unequal, contribution rates are significantly lower (especially in the case of education level). This result may indicate that players tend to cooperate more easily with peers, i.e. with players they already know or whose observable characteristics suggest a certain degree of affinity.

3. Round 2 results

The estimates of the programme effect on the probability of contributing in the second round are reported in Table 4. As with the first round, we run a probit to model the probability of contributing to the public project. Again, the various specifications we report in the various columns differ in the types of variables we control for.

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[25]However, we report that experimenter 3 was the only man in the team and he only conducted sessions in El Pozón. The other two experimenters performed experiments in both El Pozón and Ciénaga.

[26]We represent group heterogeneity by 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.

TABLE 4

Programme's impact on the cooperative decision: Round 2

Dependent variable: 1 if player contributed to the group account in Round 2

Independent variables	Spec. 4	Spec. 5	Spec. 6	Spec. 7
El Pozón dummy	0.274***	0.204*	0.135	0.089
	(0.067)	(0.113)	(0.255)	(0.254)
Basic controls – participant's characteristics				
Married or civil partnership	0.127**	0.127**	0.100*	0.093*
	(0.055)	(0.058)	(0.053)	(0.053)
Level of education (0–5)	0.002	0.001	–0.003	–0.008
	(0.015)	(0.014)	(0.014)	(0.014)
Household size	0.007	0.006	0.002	–0.004
	(0.010)	(0.010)	(0.010)	(0.010)
House has dirt floor	–0.083**	–0.084**	–0.062*	–0.052
	(0.036)	(0.035)	(0.033)	(0.037)
Number of years living in the neighbourhood	0.005***	0.005***	0.005**	0.004**
	(0.002)	(0.002)	(0.002)	(0.002)
Water by pipe	–0.001	–0.002	0.005	–0.023
	(0.059)	(0.061)	(0.051)	(0.050)
Sewer system	–0.070	–0.074*	–0.075*	–0.063
	(0.048)	(0.044)	(0.040)	(0.042)
No electricity	–0.179***	–0.173***	–0.176***	–0.185***
	(0.063)	(0.061)	(0.050)	(0.045)
Session characteristics				
Number of players in session		–0.020	–0.089***	–0.083***
		(0.027)	(0.029)	(0.031)
1 if there is at least one man in the session		0.044	–0.179**	–0.193**
		(0.082)	(0.085)	(0.079)
Experimenter 2 (female)		–0.118	–0.092	–0.098
		(0.088)	(0.099)	(0.099)
Experimenter 3 (male)		0.097	–0.006	–0.027
		(0.097)	(0.071)	(0.075)
First session in the day		–0.013	0.036	–0.009
		(0.079)	(0.071)	(0.068)
Behaviour in Round 1 of previous two sessions[a]		–0.005	–1.142***	–1.274***
		(0.425)	(0.410)	(0.428)
Session composition (information within session)				
Average of level of education			–0.199*	–0.154
			(0.118)	(0.117)
Standard deviation of level of education			–0.416***	–0.318**
			(0.123)	(0.125)
Standard deviation of age			–0.084***	–0.077***
			(0.027)	(0.028)
Standard deviation of number of years living in the neighbourhood			–0.034	–0.028
			(0.031)	(0.031)
Average of age			0.068**	0.069**
			(0.028)	(0.028)
Average of number of years living in the neighbourhood			0.062***	0.059***
			(0.022)	(0.023)
Experimental characteristics				
Player's decision in Round 1				0.299***
				(0.073)

The results reported for specifications 4 to 6 are not too different from those reported in Table 3 for the first-round contribution. However, it should be noted that the programme effects are estimated with less precision: this implies that the results for specifications 5 and 6 are not statistically different from zero although the point estimates are not dramatically different from those reported in Table 3 for specifications 2 and 3a.

The pattern of coefficients on the individual-level variables is different from that for Round 1. Players at the bottom of the socio-economic distribution show lower levels of contribution (see dirt floor and access to electricity). The size of the household and the education level are no longer correlated with players' decisions, whereas having a partner and living in the neighbourhood for a longer time are. As for the session-level variables, the presence of a man in the session has a very different effect, resulting now in a decrease in the probability of contributing to the public good.

In the last column of Table 4, we also add to the equation that explains the probability of contributing in the second round the individual's decision to contribute in the first round.[27] As the contribution in the first round is affected by the programme, the coefficient on the El Pozón dummy should not be interpreted as the programme effect on the second-round propensity to contribute. We find that, conditional on what has happened in the first round, the effect is not there. On the other hand, the decision in the first round has a significant effect of almost 30 percentage points in determining players' behaviour in the second round, indicating a high level of persistence in cooperation choices, as was shown in Figure 3.

Once again, we find that group inequality (captured in terms of age and education) is detrimental to cooperation.

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[27]We also include the average level of cooperation in the first round. While players do not know how many players contributed to the public good in the first round, they may learn about others' behaviour during the time for communication. As it turns out, this variable is not significantly different from zero and its exclusion does not change the results.

VI. 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. There has been some discussion on the appropriateness of behavioural measures derived from experimental games compared with survey measures, but a clear-cut conclusion has not been reached. Glaeser et al. (2000) find that answers to traditional survey attitudinal questions on trust are not significantly related to individual choices in a trust game setting. Conversely, Anderson, Mellor and Milyo (2004) argue that attitudinal survey measures do indeed correlate to experimental outcomes in a VCM game, better than behavioural survey measures such as participation in civic groups and volunteering. Our study differs substantially from these, as the experiment is conducted in the field. It is therefore useful to relate our measure to more conventional measures of social capital that have been used in the literature.

Besides a wide set of traditional indicators for the measurement of social capital with a survey-based approach, which are mainly centred around participation and values, our database also includes information about the knowledge networks and the leadership patterns within each session. In this section, we analyse this information both to compare possible measures of social capital and to check whether the programme shows effects on some of them.

1. Connectivity and leadership

For every session, we can construct a relationship matrix that describes the existing networks among players. One-to-one relationships are characterised according to four possible categories: relatives, friends, acquaintances and strangers. This information allows us to calculate a set of variables on session connectivity and eventually control for the strength of the 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 acquaintances in the group.

Table 5 reports the average levels for the various connectivity indices as well as a test of whether they are significantly different in the two neighbourhoods. The table shows that social networks are generally stronger in El Pozón, where players are more likely to be participating in the game

TABLE 5

Social capital measures

			Per cent
	El Pozón	*Ciénaga*	*Total*
Session connectivity measure			
Relatives within the session ***	0.11	1.07	0.59
Friends within the session *	5.91	2.89	4.42
Acquaintances within the session **	38.73	27.43	33.15
Connected (relatives, friends or acquaintances) within the session ***	44.75	31.40	38.15
Leadership measures			
Players reporting that there was a leader in the session ***	90.06	35.33	63.02
Players reported as leader in the session ***	43.86	22.75	33.43
Leader popularity in the session[a] ***	3.69	1.47	2.59
Civic membership			
Membership of at least one organisation **	43.57	33.53	38.61
Voluntary work ***	23.39	7.49	15.53
Religious ***	15.79	8.08	11.98
Educational	8.48	11.38	9.91
Juntas de Acción Comunal	7.02	9.88	8.43
Environmental management **	6.43	2.99	4.73
Charity (other than as beneficiary)	2.92	1.80	2.37
Cultural or athletic	2.05	2.40	2.22
State-sponsored activities *	2.05	0.60	1.33
Surveillance association	1.17	1.50	1.33
Labour union or sector association	1.46	0.60	1.04
Political movement or party	0.58	1.20	0.89
Quality of civic participation			
Participation in neighbourhood decisions ***	69.03	40.06	54.69
Participation in voluntary work in the neighbourhood ***	71.81	51.39	61.82
Attendance at meetings (any civic association) **	43.57	33.23	38.46
Decision-maker (any civic association) ***	39.77	27.25	33.58
Leader (any civic association) ***	26.02	10.78	18.49
Support with money or voluntary work (any civic association) **	41.23	29.94	35.65
Frequency (number of hours) (any civic association) ***	12.51	5.23	8.91
Alternative social capital measures			
Vote in local elections ***	60.23	44.31	52.37
Vote in presidential elections ***	84.21	49.40	67.01
Trust most of the people in the community *	8.19	4.49	6.36
Trust (index 0–2) ***	0.84	0.66	0.75
Perceive cooperation in the community ***	28.07	20.36	24.26
Familias en Acción activities			
Madres Líderes	16.70		
Participation in *Encuentros de Cuidado*	97.06		

[a]Average of percentage of people who mentioned the same leader in the session.
Notes: See previous page.

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' 44.8 per cent of the other players in the session, 13.4 percentage points more than in Ciénaga. Intuitively, this might be partly due to the social networks established amongst beneficiary women through FA. If we think that the frequencies of 'friendship' and 'acquaintanceship' are measures of social capital, information in Table 5 is consistent with our findings that indicate an effect of the programme on social capital.[28]

The information we have collected on networks also allows us to calculate three interesting measures of leadership: (a) the proportion of players who were referred to as leaders in each session; (b) the proportion of players who indicated that there was a leader in the session; and (c) the proportion of players mentioning a particular leader in the session (leader's popularity).

We find that leadership mechanisms are stronger in El Pozón, possibly in association with the social dynamics fostered by FA. For example, 90 per cent of players in El Pozón indicate that there is a leader in the group, whereas this happens for just 35 per cent of the players in Ciénaga. This variable can be considered to be a good measure of empowerment. Moreover, leadership seems to be relatively more dispersed in El Pozón, where 43.9 per cent of the players are signalled as leaders (by at least one member in the session). Reported leadership in Ciénaga is concentrated on a smaller number of players (22.8 per cent). 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 (16.7 per cent). However, we find that 84 per cent of *Madres Líderes*, an institution created by the programme, are reported as being leaders in the session.

The popularity of leaders (which we calculate as the proportion of players mentioning each particular leader in the session) is low in both neighbourhoods, 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, reaching 10 per cent.

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[28]A worrying feature of our data is that our subjects are more likely to be interacting in the same session with their relatives in Ciénaga than in El Pozón. It is difficult to imagine that the programme directly affects this indicator. Hence one hypothesis here is that the game recruitment process in Ciénaga exploited to a greater extent existing family networks. Of course, the presence of relatives can determine the individual's behaviour in the VCM game. Given the very small number of relatives in our sample, our results do not change if we add this variable to the list of session control variables that we used for the models presented in Section V.

2. Alternative measures of social capital

As we mentioned above, the post-game survey also included a large set of questions aiming to measure players' social capital from perspectives other than the experimental one. In Table 5, we also present some descriptive evidence of players' characteristics in terms of civic participation and membership of social groups and organisations, which is one of the most common proxies for social capital. While the differences between membership of associations in El Pozón and Ciénaga are not always significant, participation in religious, voluntary, environmental management and, to a lesser degree, state-sponsored associations is higher in the former than in the latter. Players in Ciénaga show more intense civic participation in neighbourhood committees (*Juntas de Acción Comunal*) and school parents' associations (educational), which are probably the most institutionalised spaces for civic participation in Colombia.[29] These 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.[30] The probability that players participate in at least one civic group is 10 percentage points higher in El Pozón. This seems to be mostly associated with more intensive participation in religious associations (excluding religious functions) and voluntary and state-sponsored activities (which may include FA-associated activities such as training sessions at the *Encuentros de Cuidado*). Finally, with respect to participation in decisions concerning neighbourhood life and involvement in voluntary work in their neighbourhood (especially physical infrastructure improvement), players in El Pozón had participation rates that were 20–30 percentage points higher than those in Ciénaga.

In addition to the previous statistics, Table 5 contains some evidence concerning the quality of players' membership of the civic groups and associations reported. All indicators show that civic membership is more intense in El Pozón. Players in the treated neighbourhood are likely to spend more time in the respective organisations (both in terms of attendance at meetings and in terms of hours). Also, they are more likely to be involved in roles of responsibility within the organisations and to contribute with money or voluntary work.[31]

We continue our review of possible alternative measures of social capital with the analysis of another proxy that has been widely used in the literature – electoral participation – and a set of direct questions on trust and social

[29]Although these differences are not significant in levels, they become so after conditioning for participation in at least one organisation.

[30]See Pellerano (2009).

[31]For these indicators, we ask 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 do you spend attending this group?'.

preferences similar to those commonly included in questionnaires aiming to measure social capital. Electoral participation is significantly higher in El Pozón than in Ciénaga.[32] The difference is quite striking in the case of presidential elections, where 35 percentage points more FA beneficiaries voted than non-beneficiaries. This evidence is suggestive of the political value of a programme such as *Familias en Acción*. We are not concerned with this issue here.

As already mentioned, our survey contains some direct questions on 'trust' that were modelled on standard questions often used in social capital surveys. In particular, we asked the subjects: 'In general, do you think that in your community …?'. The options were: 'it is possible to trust in most of the people'; 'it is possible to trust in few people'; and 'it is not possible to trust in anyone'. These direct measures of trust yield particularly low estimates of social capital, with just 6 per cent of the players reporting that they trust the majority of their neighbours. When calculated with a trust index (which takes the value 2, 1 or 0 respectively if the player claims to trust the majority, a few or none of her neighbours), players in El Pozón show higher pro-social attitudes. Moreover, players in the treated neighbourhood perceive others' social preferences (such as altruism and reciprocity) in the community to be greater – for example, a larger percentage of them agree that 'most of the people try to help in the community'.

3. Correlation between cooperation in the VCM game and alternative measures of social capital

We have now presented descriptive evidence on several possible measures of social capital. Some of these have been widely used in the literature. We have found that the FA programme seems to have had an effect on some of the measures, such as our measure based on behaviour in a public goods game. We now relate our measure directly to the more traditional ones.

We start, in Figure 4, by presenting some simple scatter diagrams relating the average level of cooperation in the VCM and four alternative measures of social capital averaged at the session level: an index of trust, based on the answers to subjective questions; the percentage of people voting in presidential elections; the percentage of people who are members of civic groups and associations; and the percentage of volunteers. 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.

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[32]We asked about the last local elections in Cartagena (*Gobernador*, mayor, members of the *Asambleas Departamentales*, *Concejos Municipales* and *Juntas Administradoras Locales*). They were held 7 months after the start of the programme and 4 months before the beginning of the programme in El Pozón. We also asked about the presidential elections, which were held 11 months after the beginning of the programme in El Pozón.

FIGURE 4

Average level of cooperation in Round 1 and alternative measures of social capital
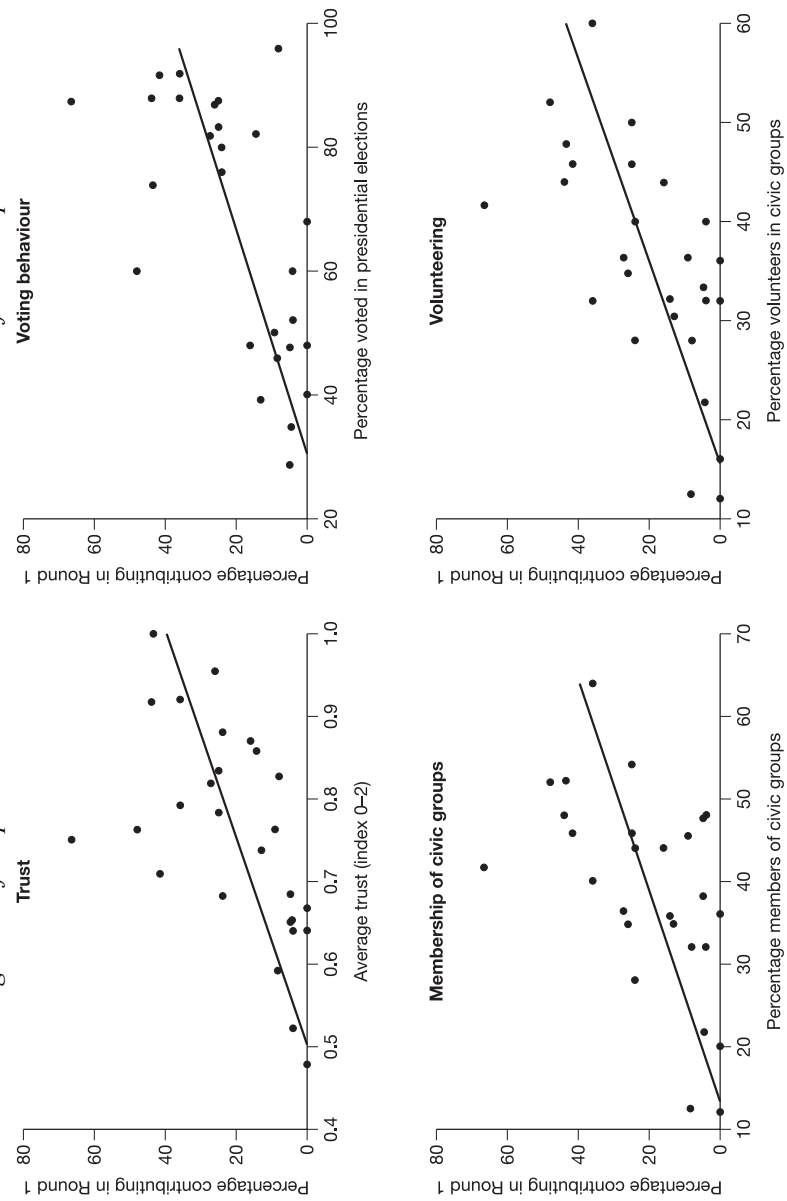
Note: Each line depicts a linear fit based on the OLS regression of percentage contributing in Round 1 on average alternative social capital measure in the session and a constant.

TABLE 6

Determinants of cooperation (session average): simple correlations

		Round 1	*Round 2*
	Membership of at least one organisation	0.535***	0.483***
	Leader of a civic organisation	0.690***	0.596***
	Participation in neighbourhood decisions	0.667***	0.501***
Session average	Participation in voluntary work in neighbourhood	0.594***	0.610***
	Vote in local elections	0.372**	0.259
	Vote in presidential elections	0.647***	0.413**
	Trust (index 0–2)	0.576***	0.430**
	Perception of cooperation in the community	0.399**	0.294

* significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent.

In Table 6, we report the simple correlation coefficients between VCM cooperation and some of the alternative social capital measures, all averaged at the session level. Voting in presidential elections and participation in decisions taken at the community level are associated with cooperation mainly in the first round. We also find that participation in voluntary work in the community and leadership are highly correlated with the decision to contribute to the group account in both rounds of the experiment. This is consistent with the hypothesis that voting in elections may reflect pre-game values and preferences whereas volunteering and leadership 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 low, particularly for the second round. Voting in local elections and perception of cooperation in the community also show low correlation with the level of cooperation.

In Table 7, we explore the association between individual cooperative behaviour in the VCM game (rather than session average cooperation) and other possible measures of social capital at the individual and session levels, while conditioning on other observable variables. For any given social capital measure, the table shows the results of a probit regression where the individual behaviour in the VCM game is explained by several controls and the social capital variable. For the latter, we use both the individual-level values and their average at the session level.[33]

We find that, when measured at the individual level, few of these alternative social capital measures are good predictors of players' decisions in the game. Most of them seem to correlate better with individual choices in the VCM when averaged out at the session level. For instance, the percentage of players being members of social organisations in the session is

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[33]The same controls as those in specification 3 in Table 3 and in specification 6 in Table 4 are used respectively for Round 1 and for Round 2.

TABLE 7

Determinants of the individual decision to cooperate: multivariate

		Round 1	*Round 2*
Individual	Membership of at least one organisation	–0.032	0.052
	Leader of a civic organisation	–0.056**	0.012
	Participation in neighbourhood decisions	–0.002	–0.016
	Participation in voluntary work in neighbourhood	–0.021	0.026
	Vote in local elections	–0.025	0.004
	Vote in presidential elections	–0.048	–0.047
	Trust (index 0–2)	0.005	0.020
	Perception of cooperation in the community	0.002	–0.049*
Session average	Membership of at least one organisation	0.363***	–0.100
	Leader of a civic organisation	0.460**	0.149
	Participation in neighbourhood decisions	–0.039	–0.304
	Participation in voluntary work in neighbourhood	–0.092	1.234**
	Vote in local elections	–0.064	–0.361*
	Vote in presidential elections	0.063	–0.398
	Trust (index 0–2)	–0.274*	–0.552*
	Perception of cooperation in the community	0.000	–0.302

* significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent.

a more informative predictor of the individual decision to cooperate in Round 1 than the fact that the player herself is a member of a social organisation.

These findings are consistent with our previous analysis, suggesting that group composition is relevant in determining individual behaviour in the VCM game, apparently even more than individual characteristics. Indeed, the experiment is designed in such a way that, independently of a player's social preferences, individual pay-offs from 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 a member of an organisation or being a volunteer in the community, may be perceived as a sign that these players have pro-social concerns. This in turn may provide a strong incentive for individual cooperation, if players are of the 'conditional cooperators' type (Fischbacher, Gächter and Fehr, 2001). Also, especially for Round 2, these results may suggest that, in order to enforce collective agreements towards cooperation, a certain 'critical mass' is required in the group to guarantee that a certain number of players commit 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 measure of session connectivity that we presented in Section VI.1. We find in Table 8 that individual connectivity measures are not associated with individual

cooperative behaviour. However, 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' the network matrix in the session is. If every player knew all the other players in the group (i.e. there was no empty cell in the network

TABLE 8

Determinants of the individual decision to cooperate (multivariate):
session connectivity

		Round 1	*Round 2*
Individual	Percentage relatives in the session	−1.418	−0.551
	Percentage friends in the session	−0.176	−0.117
	Percentage acquaintances in the session	0.008	0.005
	Percentage connected in the session	−0.009	−0.005
Session average	Group average connectivity index	0.192	0.934***

* significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent.

FIGURE 5

Average level of cooperation in Round 2 and group connectivity index
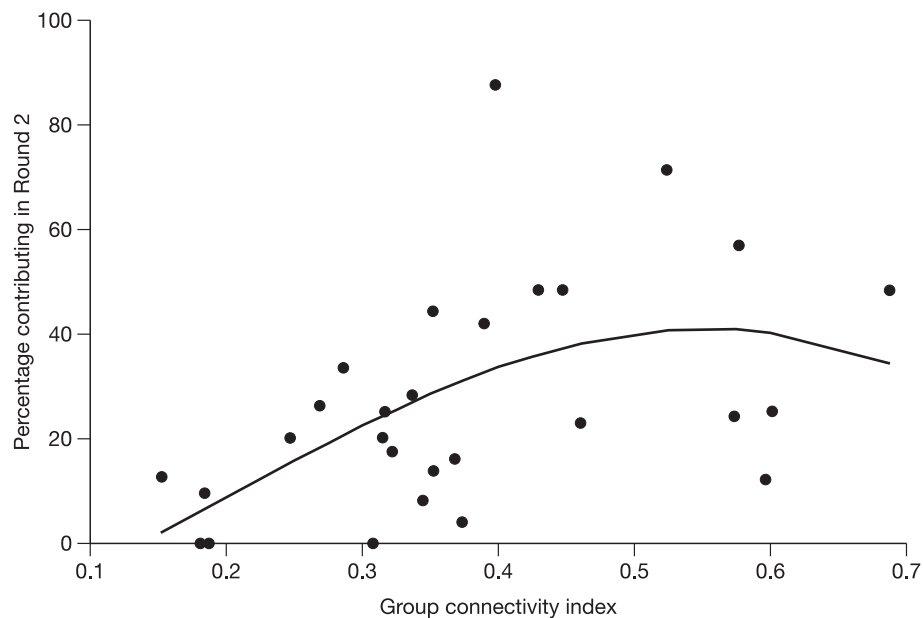

Note: The line depicts a quadratic fit of the relationship between average contribution in Round 2 and connectivity index in the session.

matrix), the index would be 1.[34] Our analysis shows that a 0.1 increase in the group average connectivity index would be associated with a 9.3 percentage point increase in the individual probability of cooperating in Round 2. It is interesting that the correlation between this average group connectivity index and individual cooperative behaviour in the VCM is higher for Round 2, after communication between players has been allowed, showing that in groups where the social bonds are stronger, it is also easier to reach agreements towards more socially efficient outcomes. Figure 5 confirms in a bivariate fashion that a positive relationship may exist between the group connectivity index and the average group contribution in Round 2.

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 per cent) than for the 14 sessions played in Ciénaga (where the network matrix is 'filled' on average at 31 per cent). According to our analysis, 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 with its capacity to promote the creation of networks amongst beneficiary women.

There are several possible interpretations of the analysis in this section. The lack of perfect correlation between the different measures of social capital that we have analysed could simply reflect the fact that different tools

FIGURE 6

Group connectivity index by neighbourhood
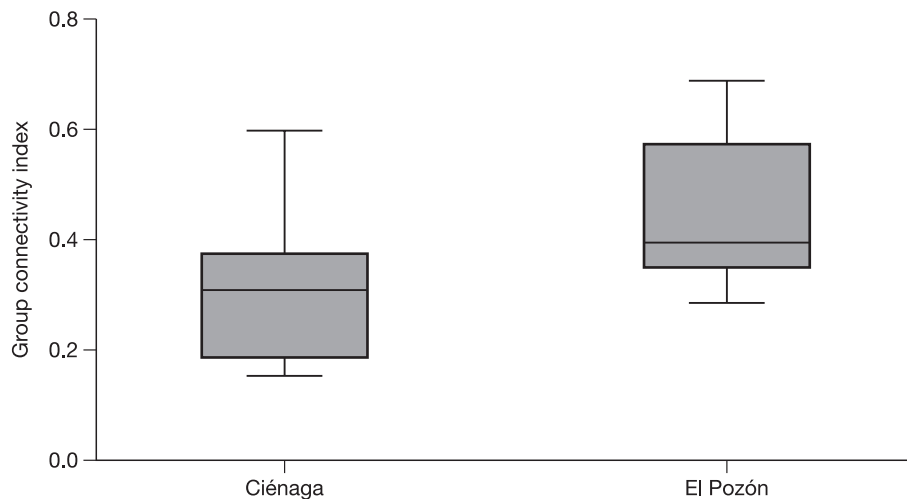
Notes: Boxes cover values included between the 25th and 75th percentiles of the distribution. Lines within boxes indicate the median. Other lines indicate maximum and minimum values.

[34]On average, the index has a value of 0.38, which means that 38 per cent of the one-to-one relationships in the group happen between relatives, friends or acquaintances.

are measuring different aspects of social capital. For instance, it could be that behaviour in the VCM game reflects factors such as altruism towards and social norms regarding other members of the group, while answers to 'trust' questions reflect the degree of confidence in other actors in the community. While we recognise that, and the fact that social capital is a multifaceted phenomenon, we think that the ability of a community to provide a public good (in our case, the additional return implied by the group account) is particularly salient for the ability to improve economic well-being.

VII. Conclusions

In this paper, we have proposed a new measure of social capital, constructed by using experimental games played by the representatives of poor households from two poor neighbourhoods in Cartagena, Colombia. The game, a version of a voluntary contribution mechanism (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 stems from the observation that when the game was played in two adjacent neighbourhoods – one where the conditional cash transfer programme *Familias en Acción* has operated for over two years and the other where the same programme was about to start but had not yet been operating – our measure of social capital was much higher in the former than in the latter. While it is possible that the marked difference between the two neighbourhoods could be due to pre-existing differences, the result is suggestive of the hypothesis that the programme, through its social activities, does increase social capital.

When we check for differences in observable variables between the two neighbourhoods, we do find important differences. The 'treatment' neighbourhood is considerably 'less poor' than the control one. However, our result survives if we control for these observable differences. It also survives when we control for a variety of other factors, including session factors.

If we take these results at face value, our evidence suggests that conditional cash transfer programmes might have important and positive side effects in that they enhance cooperation and trust in the communities where they are implemented. This evidence is consistent with many anecdotes from different contexts and with the narrative suggested by beneficiaries and programme officials.

If this result is confirmed, the next issue is to identify the channels through which conditional cash transfer programmes improve social capital. One obvious suggestion is the community meetings that constitute an

important part of the programme. In the case of *Familias en Acción*, we know that a large majority of beneficiaries participate in the *Encuentros de Cuidado*, at least in Cartagena. It would be interesting to collect information on what happens in these meetings and relate that to behaviour in experimental games. Unfortunately, in our data set we do not have information other than on participation in the *Encuentros de Cuidado*. It would also be interesting to collect information on the frequency with which beneficiary mothers meet and participate in other programme activities.

Having proposed a new measure of social capital, we compared it with other more traditional measures, either based on information about social participation of the subjects that participated in the games or based on self-reported measures of trust. We find some positive correlations between our measure and the more traditional ones at the aggregate session level. However, the correlation is weaker when individual measures are taken into account, and low for the self-reported trust measures.

Finally, looking at a group average measure of connectivity that we calculated, we find high correlation with individual cooperative behaviour. Our findings suggest that group-level characteristics affect the individual decision to cooperate.

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