

**Coordination as a Collateral Benefit:
Lab-in-the-Field Evidence from a Conditional Cash Transfer Program**

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Abstract

Conditional cash transfer (CCT) programs have positive effects on health and education. This economic field experiment tests the collateral benefits of a CCT program on improving coordination. A novel minimum effort coordination game captures the ability to overcome risk uncertainty within a sample of 714 CCT beneficiaries in Colombia. There is a sizeable effect of the CCT program on coordination, as those exposed to the program for over a year are more likely to exert the highest level of effort and reach the highest level of earnings possible.

CCT beneficiaries not only have to comply with health and education requirements but also interact with local program officials and community leaders, and other neighbor beneficiaries. Beneficiaries also have the choice to attend other group meetings that provide support to community-based initiatives, teamwork, group identity, and solidarity. Though this raises different possible channels, the analysis reveals that the improvement in coordination is not due to potential confounds such as willingness to cooperate in spite of free-riding incentives (measured with a public goods game), connectivity (measured with network data for each participant within a session) or socio-economic characteristics.

A structural choice model of the individual decision to coordinate highlights the role of beliefs about others' behavior as they determine whether individuals choose the highest level of effort. The findings support nascent initiatives to influence beliefs through policy instruments.

JEL Codes: C92 (Experiments Laboratory, Group Behavior), D70 (Analysis of Collective Decision-Making); D78 (Policy making and implementation); Z13 (Social norms and social capital)

Keywords: lab in the field experiments, coordination, social preferences, conditional cash transfer programs, cooperation, social networks

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1. Collateral benefits, coordination and public policy

Social policies may improve economic outcomes through changes in the structures of social relationships. Conditional Cash Transfer (CCT) programs have become one of the most popular interventions in developing countries. There is a strong line of research showing that CCTs are successful in their goals (i.e. nutrition, education and health) but the contrary occurs with the study of collateral benefits of these programs. It turns out design of CCT programs originally includes a strong ‘social’ component that may affect the current social structure and social attributes in a community. This makes CCTs a natural policy intervention to study the existence of collateral benefits.

Furthermore, the ability to coordinate by a community or group is key to solve collective action problems and market failures thus brings economic development, builds efficient institutions and avoids conflicts (James Samuel Coleman 1987; Matsuyama 1997; Hoff 2000; Rousseau 2000; Hoff and Stiglitz 2001; Bowles 2004; McAdams 2008) as well as promote entrepreneurship (Adler and Kwon 2002). In many developing countries where weak institutions and a weak rule of law are prevalent, coordination allows to achieve efficient outcomes. Any signal that helps to coordinate and achieve outcomes that are more efficient improves wellbeing and is thus highly valuable to the community.

Despite its importance for development and growth, measurement of coordination abilities in a community is scarce². The main contribution of this study is the use of an experimental measure based on the behavior in a coordination game with social networks. This study uses choice experiments, which, in contrast to survey measures, are incentivized, involve real behavior and eliminate sources of heterogeneity that may confound estimation of preferences from life choices. The use of ‘lab in the field’ experiments as a method to study social attributes within a community is not new³. Public good and trust games have been used in a variety of different situations, both urban and rural. This is not the case for coordination games⁴.

This study conducts an artefactual field experiment⁵ and combine experimental and non-experimental data to study the effect of a CCT program on the ability to coordinate in a developing country. When examining the relation between the exposure to the program and behavior in the game, we find that the length of exposure of the beneficiary to the program matters: longer exposure is positively correlated with choosing the Pareto-dominant equilibrium in our coordination game. CCT beneficiaries not only have to comply with health and education requirements but also interact with local program officials and community leaders, and other neighbor beneficiaries. Beneficiaries also have the choice to attend other group meetings that provide support to community-based initiatives, teamwork, group identity, and solidarity. Though this raises different possible channels, the analysis reveals that the improvement in coordination is not due to potential confounds such as willingness to cooperate in spite of free-riding incentives (measured with a public goods game), connectivity (measured with network data for each participant within a session) or socio-economic characteristics. We argue that the CCT changed beliefs about other’s behavior and allowed beneficiaries to overcome coordination failures.

Our paper contributes in several ways to a recent stream of research combining policy impact evaluation

² There is a constant debate on the validity of the survey measures and other qualitative measures to capture such social attributes in a community (Portes and Landolt 2000; Narayan and Cassidy 2001; Putnam 2001b, 2001a; Kawachi et al. 2008).

³ Carpenter (2002); Carpenter et al. (2004); Gaechter et al. (2004); Karlan (2005); Cardenas et al. (2009); Fearon et al. (2009); Voors et al. (2012); Gilligan et al. (2014).

⁴ We also use a Public Goods (PG) game. This study is the first on examining behavior in these two games to distinguish between beliefs (coordination) from social preferences (cooperation).

⁵ According to Harrison and List (2004) taxonomy of field experiments.

and experimental measures in the field. Using coordination games as instruments to identify beliefs and social norms is very recent (Krupka and Weber 2013; Erkut et al. 2015). To our knowledge, this is the first study that implements an n -person coordination game with more than two ranked equilibria in the field in order to measure the ability to coordinate and thus, individual beliefs. Our game design aims to be a better adaptation to the field of the coordination problem. Agents must coordinate on a common action with the group's success depending on the least favorable action of a team member. The minimum effort game is an adaptation of the stag hunt game⁶ (Holt 2007) with multiple choices and subjects. This is a more realistic design if we want to examine how groups of more than two people coordinate and reach the most efficient outcome.

Brooks et al. (2015) is the only other study so far that uses a coordination game in the field to study coordination. They conducted a (two-person) stag hunt game to examine the role of culture on the efficiency of coordination among men from different castes in India⁷. Our study differs in several ways with theirs. First, although their design is a useful abstraction of the ability to coordinate in the textbook, most of interactions in the field are n -participants and usually within a broader set of options. We use an eight-player-three choices coordination game with three ranked equilibria. Second, Brooks et al. (2015) is indeed the first study on culture and coordination efficiency in the field and ours is the first one looking at our design as a potential measure of empirical expectations in the field. Third, we do exploit the role of social networks on coordination. Fourth, though culturally diverse their sample is small and composed of only men. Our sample is larger, heterogeneous in a wide range of socioeconomic variables and focused on the poorest of the poor.

In addition, despite the extensive experimental literature on coordination in the lab, evidence on coordination in the field is almost nonexistent and there is no evidence on coordination within a policy intervention or with policy implications. Most of the literature focuses on the structure of coordination games and achieving efficiency in the lab (i.e. learning, social networks, monetary incentives). This paper is the first that uses a coordination game within a CCT framework and our results confirm the importance of the social component of these interventions at the community level⁸.

The paper is organized as follows. Section 2 offers a brief introduction to the institutional setting of the CCTs. Section 3 describes the economic game and explains how this behavioral experiment is useful to capture a social norm. Section 4 describes the data and experimental set up. Section 5 quantifies the relation between the CCT and the ability to coordinate. Section 6 examines the role of other confounding factors such as willingness to cooperate, networks and other individual characteristics on coordination. Section 7 presents a structural estimation that captures the role of beliefs on effort choice. Last section concludes.

2. The Conditional Cash Transfer program: *Familias en Acción*

⁶ The stag hunt game is a two-player, two-choice coordination game with a payoff-dominant equilibrium and a risk-dominant one.

⁷ For a very similar experimental design in India, see also Chakravarty et al. (2015). Boschini et al. (2014) examined gender-based focal points or conventions by using a battle of the sexes game (i.e. a coordination game with multiple equilibria but the equally efficient and different allocations) and use a random sample of Swedish citizens. Bosworth (2013) also uses a Stag Hunt game in the lab as a measure of social capital, and find that traditional survey measures of trust is related to behavior in the experiment with 20 students. This positive relation is consistent with the findings of Anderson et al. (2004) and Thoni et al. (2012) on a Public Goods game, who use a student sample and a random sample from the Danish population, in the lab and online, respectively.

⁸ This study also contributes to the social norms literature. Mackie et al. (2015) examine about 200 publications on social norms and development; only 14% discuss norms-measurement methods, most of them on qualitative data and none of them on expectations.

Familias en Acción is a CCT that was inspired by the Mexican CCT PROGRESA and whose goal was to reduce extreme poverty in the medium term by providing resources to improve the nutritional status of poor households and in particular their children as well as school enrolment⁹. To get access to the program's grants, beneficiary households have to comply with a number of requirements. FA has three components: a nutritional and health component aimed at households with children less than five, an education grant for children in primary school and an education grant for children in secondary school and a social component, articulated around periodic meetings of beneficiaries¹⁰, called Care follow-up Meetings (EC) [*Encuentros de Cuidado*]¹¹. The health and nutrition grant, roughly equal to US\$25 independent of family size, is conditioned on attending regularly growth and development check-ups for children, a vaccination program and some 'classes' on hygiene, diet and contraception. The educational grants, aimed at households with children aged seven to seventeen, are conditional on enrolment and regular attendance in school. Each child in primary (secondary) school entitles the household to about US\$8 (US\$16) per month. Households receive a total transfer which may oscillates between 10% and 21% of the minimum wage and between 25% and 50% of the average level income of the poor (DNP 2010; MESEP 2012)¹².

Although participation to the EC meetings is not compulsory to receive the transfer, most beneficiaries (95.94% in our sample) participate at ECs where, in addition to discussing hygiene, nutrition or other health-specific issues, they have the possibility to discuss a topic or simply chat. Beneficiaries are invited to attend the meetings, which are introduced as key for human capital investment. Conversations with program's officials and with beneficiary mothers indicate that these social aspects are indeed an important feature of the program: beneficiary mothers discuss any community-related issues, and by doing so they reach a common ground to make decisions and take actions aimed at improving their life conditions. They start new activities, get to know each other better and improve their ability to act as a group.

Additionally, the beneficiaries elect a representative, called Mother Leader [*Madre Líder*] (ML) who is in charge of communication with the local office and is also in charge of organizing the social activities and educational meetings (such as the EC). The ML's often assume a prominent and visible role in the community.

Our CCT would affect community features once the program is able to affect social interactions and their environment (Coleman 1988). For example, FA may create networks or strengthen the current ones and improve the structure of social relationships among beneficiaries (Putnam 1995), promote leadership (Latham and Saari 1979; Bass 1991) and give mothers the opportunity to start working as a "social group" by perceiving a strong identification with the program (Tajfel 1982) and their power to act 'together' (Warren 1998). In addition, our CCT may affect the beliefs about others' behavior. First, by becoming a beneficiary a new group identity emerges which would change the perception of the community traits. Beneficiaries share the same paperwork load, health check-ups, payment logistics and the same interests. Second, the EC and beneficiaries' assemblies are a place of encounter with people that face the same needs and interests. This continued interaction among beneficiaries may change perceptions

⁹ The program has become the flagship of the Colombian government's social policy as it targets the poorest 20% of Colombian households. It started in 2002 in 627 small rural areas. In 2007, it expanded to all urban areas in order to include 1.5 million beneficiary households. This CCT is targeted to women, like every other CCT in Latin America.

¹⁰ For evidence of success of FA on the target outcomes and other outcomes such as crime and voting behavior see a survey in Attanasio et al. (2015).

¹¹ In addition to the EC, the beneficiaries take part in the general assembly, where they elect the ML. The general assembly is a public meeting where beneficiaries discuss and decide about problems affecting beneficiaries in Cartagena. There are four annual assemblies, taking place on a date set by the local office.

¹² In Colombia, most welfare programs use the so-called SISBEN score, a poverty indicator that is updated periodically. Based on this score, households are assigned to one of six categories. FA targets the level 1 of SISBEN and displaced people.

about others' behavior and thus create and enforce social norms.

3. Minimum Effort Coordination game: the role of beliefs and social norms

Collective action may facilitate coordination in a strategic environment with multiple Pareto-ranked equilibria (see for example, Bryant (1983); Hirshleifer (1983)).¹³ In order to examine equilibrium selection in the presence of collective action (Harsanyi and Selten 1988), we consider a very well-known game in the literature. The minimum effort coordination game introduces a conflict between payoff dominance and risk dominance¹⁴. An individual's payoff depends on her own effort as well as on the minimum effort of the group. The higher the minimal effort, the higher every member's payoff is. In contrast to social dilemma games (e.g., Public Good games), any common effort level chosen by all group members is an equilibrium, so it is in no one's interest to deviate upward or downward from the common effort. Hence choosing the most efficient (i.e., payoff-dominant) equilibrium is a problem of coordination rather than one of cooperation.

As an experimental design, consider an adaptation of Van Huyck et al. (1990) and the following values of parameters: $n = 8$ (eight players), $E = 3$ (three choices). Then the payoffs can be described by the matrix presented in Table 1 below. Players simultaneously determine their level of effort $e_i \in \{1, 2, 3\}$. The payoff of player i is determined by the minimum level of effort in the group minus the cost of effort he incurs

$$(1) \quad \pi_i^{ME} = \pi(e_i, e_{-i}) = 3 \left(1 + e_{[1]} - \frac{2}{3} e_i \right)$$

where $e_{[1]} = \min\{e_1, \dots, e_n\}$ and e_{-i} is the $(n-1) \times 1$ vector containing the other players' effort levels.

Table 1. Coordination game. Payoffs table*.

		Minimum Effort Level chosen in the group		
		3	2	1
My decision (effort level)	3	\$6	\$3	\$0
	2		\$5	\$2
	1			\$4

*Values are in thousands of Colombian pesos

Any common level of efforts $e_1 = \dots = e_n$ is a Nash equilibrium, and such equilibria are Pareto-ranked. In the presence of strategic uncertainty, risk dominance may yield an individually rational outcome that is not efficient but safe. However, payoff dominance will guarantee a collectively rational and efficient outcome. Given the strategic uncertainty, individual i maximizes the expected utility of his payoff in the game.

There are three Nash equilibria in this game and only the belief about other's choosing a certain level of effort will motivate the individual to exert that level of effort. This game shows the tension between payoff dominance and a secure and inefficient equilibrium. The only problem faced by the players is to coordinate in either one of the three Nash equilibria. Since the most efficient equilibrium – Pareto superior (i.e. to exert the highest effort level), it is reasonable to assume that players would prefer that outcome. However, choosing the highest level is still risky since if for some reason the other player

¹³ Harsanyi and Selten (1988) present payoff dominance as based on collective rather than on individual rationality. However, most theoretical work on equilibrium selection in coordination games concerns 2x2 games (Harsanyi and Selten 1988; Carlsson and Van Damme 1993; Kandori et al. 1993; Young 1993; Anderson et al. 2001).

¹⁴ Notion introduced by Harsanyi and Selten (1988). This game is also called the weakest-link game. Many economic and organizational contexts feature situations where the worst component of a product or process determines its overall quality (Camerer and Knez 1994; Foss 2001).

deviates, others are left with the lowest possible payoff. Hence, if there is uncertainty of the other player's action, deviation from the equilibrium is unavoidable.

This particular coordination game has been used extensively in the lab¹⁵. In fact, experimental evidence supports the prediction that a risk-dominant equilibrium will be favored over the Pareto-dominant equilibrium – i.e. a coordination failure (Van Huyck et al. 1990; S. P. Anderson et al. 2001; Camerer 2003) unless there is a social norm or institution that re-directs behavior (Bowles 2004)¹⁶. In the presence of strategic uncertainty, the risk associated with not knowing how your opponent will play the game, risk dominance may yield an individually rational outcome that is not efficient but safe. However, payoff dominance will guarantee a collectively rational and efficient outcome.

A social norm is an equilibrium selection criterion (Schelling 1960; Horwitz 1990; Kandori et al. 1993)¹⁷. Social norms are now proposed by theory of law as a coordination device and a efficient alternative to solve collective action problems as it provides a signaling mechanism (Ellickson 1991; McAdams 1997; Posner 2002). A social norm is a pattern of behavior such that individuals prefer to conform to it on the condition that they believe that most people in their reference network i) conform to it (i.e. *empirical expectations*)¹⁸ and ii) *think* they **ought** conform to the norm (i.e. *normative expectations*) (Bicchieri 2005, 2014)¹⁹. Given that decisions are private and individual in the ME game, individual beliefs consist of empirical expectations when all players coincide in any equilibrium and also normative expectations when all players coincide in the equilibrium that is best for everyone in the group. The combined force of normative and empirical expectations makes norm compliance a superior choice and makes deviation, a bad choice because punishment may follow, or just because one recognizes the legitimacy of other's expectations (Sugden 2000).

Empirical expectations are key for social norms to evolve and they are mostly based on observations of what individuals in the reference group have done in the past (Bicchieri 2014). In addition, in repeated encounters, people have an opportunity to learn from each other's behavior, and to secure a pattern of reciprocity that minimizes the likelihood of misperception²⁰. On the other hand, communication is key in making efficient coordination a focal point (Blume and Ortmann 2007; Choi and Lee 2014)²¹. The CCT

¹⁵ See Cooper (1999); Portes and Landolt (2000); Devetag and Ortmann (2007) for surveys on payoff-asymmetric coordination games in the lab.

¹⁶ Among the determinants of achieving the payoff-dominant equilibrium there is evidence in the lab on group size and cost of effort (Van Huyck et al. 1990, 1991), number of interactions (Berninghaus and Ehrhart 1998; Knez and Camerer 2000; Parkhurst et al. 2004), randomness in matching (Keser et al. 1998; Schmidt et al. 2003; Goeree and Holt 2005), information about other player's actions (Berninghaus and Ehrhart 2001; Weber 2006), leadership (Brandts and Cooper 2007; Brandts et al. 2007; Gillet et al. 2011; Cartwright et al. 2013), advice (Brandts and MacLeod 1995; Kuang et al. 2007), monetary incentives (Goeree and Holt 2005; Brandts and Cooper 2006; Brandts and Cooper 2007), action set (Van Huyck et al. 2007), non-monetary incentives (Van Huyck et al. 1997; Bornstein et al. 2002; Blume and Ortmann 2007; Rhodes and Wilson 2008; Dugar 2010; Cason et al. 2012), subject-pool characteristics (Dufwenberg and Gneezy 2005; Engelmann and Normann 2010; Y. Chen et al. 2014; Stoddard and Leibbrandt 2014).

¹⁷ This game-theoretical approach of social norms introduces them as customary rules of behavior that coordinate our interactions with others. Once a particular way of doing things becomes established as a rule, it continues in force because we prefer to conform to the rule given the expectation that others are going to conform (Schelling 1960; Lewis 1969; H Peyton Young 2008).

¹⁸ The definition of the coordinative role of institutions and practices of society is similar to Gauthier (1986)'s: "An institution or practice is coordinative if each person prefers to conform to it provided (most) others do, but prefers not to conform to it provided (most) others do not" (in Jeske and Fumerton (2011): 81).

¹⁹ These are conceptually equivalent to descriptive norm and injunctive norm in psychology (Cialdini and Trost 1998; Fishbein and Ajzen 2011).

²⁰ This is defined as Common Knowledge by the literature of team reasoning (Sugden 2003).

²¹ Although there is experimental evidence that shows otherwise (Clark et al. 2001; Burton et al. 2005).

program may have allowed these observations occur in the community and time of exposure to the program provides the time frame that beneficiaries need to be able to see the benefits of overcoming coordination failures. This is consistent with the hypothesis that social norms emerge in small, groups in which people have ongoing interactions with each other (Hardin 1982; Axelrod 1986; Bicchieri 1993). The CCT program may have also provided a normative framework that changed as well normative expectations.

In order to exist a social norm needs people who collectively believe it exist and also believe that all people believe that everyone should obey that norm. Hence, a social norm that helps a group to overcome a coordination failure exists when individual beliefs coincide in the highest level of effort. If individuals choose the payoff-dominant strategy in a one-shot minimum effort game in a group of more than two players, their decision is a belief that the others will choose that strategy, and hence that the group holds the same belief. A social norm differs from focal points or conventions²² (Schelling 1960; Lewis 1969; H. Peyton Young 1993; Sugden 1995) which are a descriptive norm in which only empirical expectations are relevant –people don’t expect others to respond if they stray from the convention. Conventions could be measured with a coordination game with multiple equilibria but equally efficient and different allocations e.g. battle of the sexes game.

Related literature in other social sciences undervalues the potential of coordination games to capture social norms (Bicchieri and Muldoon 2014). However, our particular game and our quasi-experimental approach in measuring the effect of the exposure to the CCT allow us to indicate how the Pareto-dominant and risk dominant equilibria are attained and how beliefs –which are built via the CCT, become self-fulfilling.

In section 7, a structural choice model of the individual decision to coordinate relates beliefs with exposure to the CCT program and the ability to select the most efficient equilibrium and overcome the coordination failure.

4. Data and experimental procedures

Section 5 analyzes individual behavior in the game and using survey data we collected at the end of the experiment. In what follows we describe the recruitment process, experimental procedures and descriptive statistics of our sample.

i. Sampling, recruitment and allocation into sessions

We recruited the participants to the game with the help of the local office of FA (Enlace Municipal) in two neighborhoods -*Pozón* and *Ciénaga*- in the city of Cartagena, Colombia²³. The program was already operating in both neighborhoods and we were able to contact beneficiaries directly. Invitations were sent to 500 randomly selected participants from the FA beneficiaries list in each neighborhood. The FA office sent the invitations through the ML to those specific households in order to attend to any of the sessions held (a span of four days). We assumed a response rate of 70% and expected to run 14 sessions with 350 attendees in each neighborhood. The actual attendance rates for the new participants were 105.1% and 98.9% in *Ciénaga* and *Pozón* respectively. Our sample consisted of 714 participants, 710 of which had not participated in any game before.²⁴ This led to a total of 29 sessions with people who had never played

²² Lewis (1969:89, 95) treats the Pareto dominant equilibrium as the social contract that is not a convention.

²³ For more details on the CCT program a why we chose Cartagena, see Section 1 in the appendix.

²⁴ In 2007, we conducted only the a public goods game with 676 participants. In 2008, in addition to the sessions with new participants we also invited individuals who had participated in the public goods game in 2007. In 2008 we conducted a total of 53 sessions, 26 in *Pozón* and 27 in *Ciénaga*. 24 of these sessions had only former

before any game (14 in Pozón and 15 in Ciénaga), the average size being 24.7 participants.

Conducting lab in the field experiments in large cities presents many challenges in terms of costs, time, recruitment and attendance (Candelo and Polania-Reyes 2008; Ñopo et al. 2008). Since the sessions were scheduled on a short notice (less than a week) we gave the beneficiaries as much freedom to choose the session that suited them best as we could. This could have led to relatives or neighbors choosing the same sessions, if they both happened to be invited. In fact, some invited beneficiaries arrived to the session in groups²⁵. In both neighborhoods participants self-selected into sessions by responding to an invitation, hence the study is not based on a random sample but on a self-selected sample. The fact that individuals are not randomly allocated into sessions allowed us to explore the role of social networks on the effect of exposure to the program and social capital: We were able to obtain enough variation in terms of the density and quality of the network across sessions (See Table 6).

There is the possibility of contamination among subjects of different sessions: participants to a session could talk to participants to the next session on the way out, although we put lot of effort in avoiding these contacts. Session level controls for this potential issue include the average outcome in the two sessions immediately before and an indicator variable for those sessions which were the first ones of the day.

ii. Experimental procedures

Participants were invited to come to the local public school in their neighborhood. After collecting their identification documents and checking their names on the recruitment lists, subjects in each session were given a random identification number and seated in semi-circle in a classroom where the instructions of the games were read and explained. After the participants played the second round of the game described above, we collected a network questionnaire on the existing relationships among them while they had a snack.

Having collected the individual network data and assigned every participant to a group according to the score we generated (see Section III above), we proceeded with the coordination game. The instructions of the coordination game were read and explained. After making sure the participants understood the game, subjects were seated in three circles, back facing, in a different classroom. They proceeded with their decision, simultaneously and without communication. The results were announced to each group in private. Afterwards we announced the results of the PG game, the subjects took a survey that gathered information on a wide range of socio-economic features.

A session lasted on average two hours. Once the session ended participants were paid their earnings²⁶ based on the decisions in the experiments. On average each participant earned US\$10.04 (COL\$17595), which just over the value of the daily minimum wage²⁷.

participants. The protocol followed in the two years was identical. These old participants had to attend to sessions with only old participants. However, four people managed to stay in new sessions.

²⁵ For example, implementing sessions with 25 randomly allocated individuals was impractical and infeasible. The two neighborhoods are a two hour-drive apart; in order to minimize ‘cross-talk’ and its effects – participants talking about the experiment to future players who will participate in subsequent sessions, sessions were implemented in a four-day frame with four sessions each day in each neighborhood. For example, during the first four days we conducted the experiments with participants in *Pozón* and the following four days with participants in *Ciénaga*.

²⁶ All recruited people received a show-up fee of US\$1.1, to induce credibility and subsidize their transportation from and to their home or workplace.

²⁷ The daily minimum wage was COL\$15383 for 2008. Source: www.banrep.gov.co

iii. *Characteristics of short and long exposure beneficiaries of the CCT*

This section presents evidence to reassure on the comparability of samples in each neighborhood, by testing for the presence of the difference in observable variables that could indicate different selection process. This is the logic used -in a different context- by Altonji et al. (2005); Altonji et al. (2008); Altonji et al. (2013): if one does not find significant differences in terms of observables it is plausible to assume that there are no unobserved selection biases. Table 2 reports results separately for participants corresponding to the two levels of program exposure as of 2008: short exposure means less than a year in the program, whereas long exposure means over one year in the program)²⁸. Participants come from very poor families, with low levels of income and education. In Table 2 we also report the means by the main characteristics of the sample of a set of individual and household level characteristics, that are exogenous to the program, household socio-economic characteristics.

Table 2. Socio-economic characteristics of the participants by time of exposure to the CCT

Exogenous Variable		All	Long Exposure	Short Exposure	Difference
General characteristics	Percentage of female participants	98	99	98	1
	Average age (years)	36.2	36.8	35.8	1.1
	Years living in the neighborhood	18.5	14.9	21.2	-6.3***
	Percentage displaced	13	17	10	7**
	Percentage household head	33	24	40	-16***
	Percentage Single	11	10	12	-1
	Percentage married of civil partnership	72	78	68	10**
Educational level (percentage)	None (level 0)	3	2	3	-0
	Primary incomplete (level 1)	21	22	20	2
	Primary complete (level 2)	14	16	13	3
	Secondary incomplete (level 3)	33	35	31	4
	Secondary complete (level 4)	20	16	23	-6*
	More than secondary complete (level 5)	9	8	10	-2
Income variables	Percentage unemployed	4	3	5	-2
	Percentage with access to credit	71	72	70	2
	Percentage with access to formal credit	22	24	22	2
	Per. with food insecurity level (high)	9	7	10	-2
	Per capita monthly income (US\$)	32.0	33.3	31.0	2.3
Dwelling characteristics	Household size	5.67	5.59	5.72	-0.13
	Number of people per room	2.98	3.21	2.81	0.40***
	Percentage dwelling with dirt floor	28	32	25	6*
	Percentage owning own house	59	69	52	17***
Assets (percentage)	Mobile phone	72	78	68	9**
	DVD player	33	37	31	6
	Sound player	31	37	27	10***
Observations		714	346	368	714

Robust standard errors, clustered by session. * Significant at 10%; ** significant at 5%; *** significant at 1%. According to the official exchange rate at that date TRM: US\$1=COL\$1753.01 (monthly mean average for July 2008, <http://www.oanda.com>)

²⁸ The samples coincide almost exactly with the limits of *Pozón* (long exposure) and *Ciénaga* (short exposure) apart from 41 observations from *Pozón* that were subject to short exposure. This is due to new households in *Pozón* who became beneficiaries in the 2007 urban expansion (see more information in section i.in the appendix).

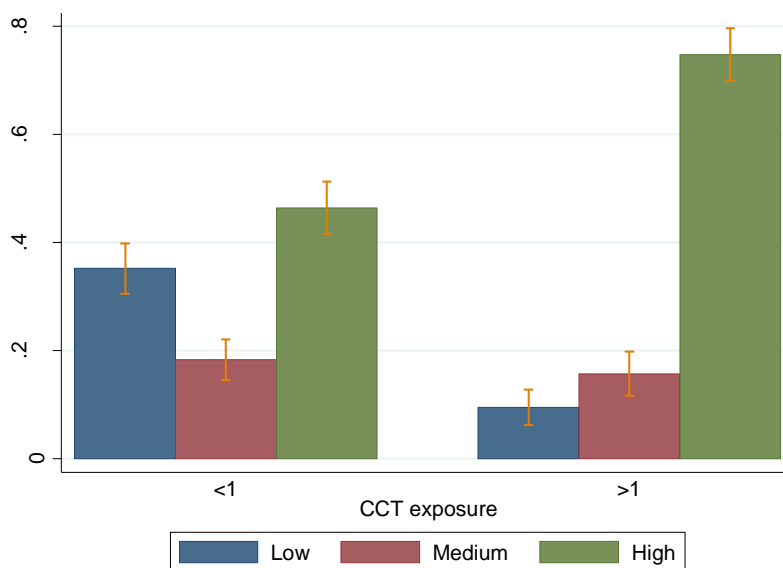
Participants with long exposure were more likely to have a partner, own the house where they lived, to own durables and to receive governmental aid by other social programs. The perception that the household income is above others' income in the neighborhood is higher for those with long exposure to the program. For instance owning a house and a mobile phone and monthly income may be affected by the fact that participants with long exposure had received the benefits from FA and other programs for a longer time.

Participants who have been enrolled in the program for less than a year are significantly more likely to be head of household, have been living in the neighborhood for more years and have more years of education. In this case, there might be a reverse causation: latter expansions of the CCT program might be explicitly targeting sectors that were previously not in. Whilst some of the effect of FA may be through its impact on socio economic outcomes, the relatively small size of differences and the presence of counterintuitive associations do not give strong support to conclude that all of its impact is through that channel.

5. Relation between the CCT and behavior in the coordination game²⁹

First, we look at the differences between the frequencies of choosing the risk-dominant and the Pareto-dominant outcomes in terms of exposure to the program. Figure 1 presents this comparison. We observe a significant difference in exposure.

Figure 1. Exposure to the program and individual effort decision

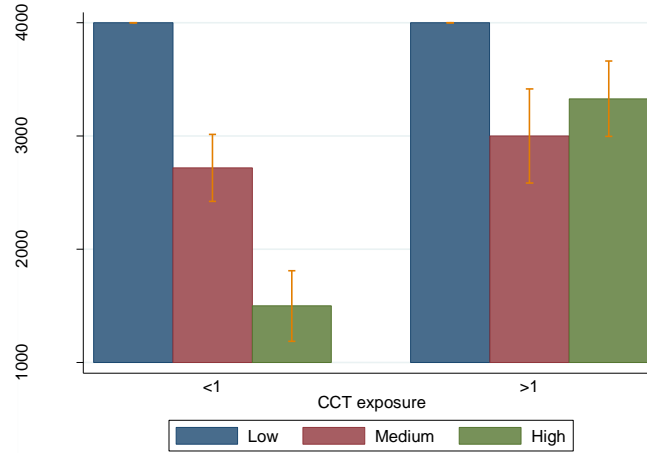


Note: The whiskers depict the 95% confidence intervals. We observe players with a higher exposure to the program coordinate into the Pareto optimal equilibrium whereas players with a lower exposure coordinate more in the risk-dominant equilibrium. A non-parametric analysis confirms that the difference is statistically significant (Mann-Whitney test, $p = 0.00$).

²⁹ In section 3 of the appendix we report the relation between traditional social capital measures collected in the survey introduced in Table 6.4 and exposure to the CCT. As controls we included willingness to cooperate, the ability to coordinate as well as network information and individual socio-economic characteristics. Among the socio-economic characteristics we include especially those characteristics we found to show differences between the short exposure and long exposure samples.

Second, earnings are higher for those who choose the higher level of effort and also are beneficiaries longer than a year. Figure 2 shows average earnings for each level of effort and enrollment exposure.

Figure 2. Individual Earnings by effort decision and exposure to the program



Note: The whiskers depict the 95% confidence intervals. We observe players enrolled in the CCT program longer than a year have higher earnings than players enrolled for less than a year. A non-parametric analysis confirms that the difference is statistically significant (Mann-Whitney test, $p = 0.00$).

In Table 3, we report the measures collected from the Minimum Effort game. We present the results separately by length of exposure (short or long) to the program. In all relevant variables that indicate the ability to coordinate on the efficient outcome, players with long exposure show significantly higher measures with +28% participants choosing the highest level of effort and +25% groups actually achieving the Pareto-efficient equilibrium. The percentage of individuals choosing the safe option was 26% higher among those with short exposure. While +26% short exposure participants chose the lowest level of effort and +35% short exposure groups achieved the risk-dominant equilibrium. This is consistent with the hypothesis that the longer the exposure to the program the better a community will coordinate.

Table 3. Behavior in the Coordination game

Variable	All	Long Exposure	Short Exposure	Difference
Average effort decision ^b	2.34 (0.11)	2.65 (0.12)	2.11 (0.13)	0.54*** (0.17)
Percent of players that chose 1	24 (0.5)	10 (0.4)	35 (0.7)	-26*** (0.8)
Percent of players that chose 3	59 (0.6)	75 (0.8)	46 (0.6)	28*** (1.0)
Average Minimum effort in the group ^b	1.54 (0.13)	1.88 (0.21)	1.28 (0.10)	0.61*** (0.21)
Percent of groups with a ME of 1	64 (0.7)	43 (1.0)	79 (0.7)	-35*** (1.2)
Percent of groups with a ME of 3	17 (0.6)	31 (1.2)	6 (0.3)	25** (1.1)
1 if the player understood that the best outcome is everyone to choose level of effort 3	0.66 (0.02)	0.70 (0.03)	0.63 (0.02)	0.08** (0.03)
Number of groups	87	42	45	87

Robust Standard errors, clustered at the session level, in parenthesis. * Significant at 10%; **significant at 5%; ***

significant at 1%. ^b The average of 1,2,3 units of effort.

Third, we use an ordinal choice model to test the hypothesis that exposure is relevant for the ability to coordinate in the most efficient outcome. Our empirical specification has as its unit of observation individual i of group g in session s . We estimate the following partial proportional odds specification with three categories of the ordinal dependent variable, Y_i , the observed value of the unobserved individual effort decision, continuous latent variable Y_i^* ³⁰. The probability that Y will take on a particular value,

$$(2) \quad P(Y_i > j) = g(X\beta_j) = \frac{\exp(\alpha_j + X_{1i}\beta_1 + X_{2i}\beta_2j)}{1 + [\exp(\alpha_j + X_{1i}\beta_1 + X_{2i}\beta_2j)]} \text{ for } j = 1, 2$$

Where X_{ki} are individual observable characteristics (a dummy for being enrolled in the program longer than a year) and X_{1i} are the variables that are constrained to be the same among levels of effort e and X_{2i} are the variables that are set free to differ³¹. Standard errors are clustered by session.

We treat the decision of the level of effort as an ordinal outcome as we the three possible equilibria are ordered from the least (i.e. level of effort 1) to the most (i.e. level of effort 3) efficient equilibrium. In order to estimate the ordinal model, we applied Brant's test of parallel regression/ parallel lines/proportional odds assumption (see Long and Freese, 2006) which equivalent to a series of binary logistic regressions where categories of the dependent variable are combined, e.g. for $e = 1$ category 1 is contrasted with categories 2 and 3; for $e = 2$ the contrast is between categories 1 and 2 versus 3. We confirmed the assumption of parallel regressions is not met (we have a significant overall chi-square value)³²: one or more coefficients differ across values of j . We also performed a likelihood-ratio test that confirms we cannot use an ordered logit model. However, it is not necessary either to implement a generalized ordered logistic model (Fu's, 1998) which sets all variables from the parallel-lines constraint since the assumption is violated only by one or a few of our independent variables, in particular the exposure to the program. We then fit a partial proportional odds model, where the parallel lines constraint is relaxed only for those variables where it is not justified³³.

Table 8 presents our results with eight different specifications. In the first 4 specifications (I to IIIb) we relate the effort decision to other experimental variables with the network information we used for the algorithm that allocated individuals into groups and the traditional measures of social capital that seemed to have an impact on the effort decision.

The first panel in Table 8 shows the marginal effects of a partial proportional odds model for the decision to contribute to the lowest level of effort, the least risky decision and Pareto inefficient outcome. The negative coefficient for exposure means that the likelihood of coordinating on the least efficient equilibrium decreases when enrolment into the program is longer than a year. On average, beneficiaries

³⁰ The continuous latent variable Y_i^* is equal to $Y_i^* = \alpha + \beta X_i + \lambda G_{gs} + \theta S_s + v_s + \varepsilon_i$, where the disturbance term ε_i are i.i.d. Gaussian distributed error terms with mean zero and variance $\sigma_\varepsilon^2 = 1$, independent from v_s , which are iid, $N(0, \sigma_v^2)$.

³¹ N_{igs} includes number of friends, relatives and acquaintances in the group, S_s includes session size, a dummy if that was the first session of the day, and a dummy for one of the experimenters who conducted the session, G_{gs} includes a dummy if there is a man in the group, the average equilibrium in the group from the previous two sessions and the presence of a ML in the group.

³² The proportional odds assumption states that our model with 3 categories is equivalent to 2 binary regressions with the critical assumption that the slope coefficients are identical across each regression.

³³ We used a Wald tests on each variable to see whether the variable meets the parallel-lines assumption. If the Wald test is statistically insignificant for one or more variables, the variable with the least significant value on the Wald test is constrained to have equal effects across equations. See Williams (2006).

that have been enrolled longer than a year are 23 percentage points less likely to choose $e=1$. The second panel in Table 8 shows the corresponding results for the decision to contribute to the highest level of effort, the riskiest decision and the Pareto dominant strategy. The positive coefficient for exposure confirms the finding from the first panel.

Table 8. Marginal effects of a partial proportional odds model for the lowest and highest individual level of effort (N=714)

	I	II	IIIa	IIIb	IVa	IVb	IVc
Independent Variable	Low	Low	Low	Low	Low	Low	Low
Beneficiary longer than a year (enrolment)	-0.23*** (0.09)	-0.24*** (0.09)	-0.23*** (0.08)	-0.24*** (0.09)	-0.24*** (0.09)	-0.25*** (0.09)	-0.24*** (0.08)
Cooperation decision round 1		-0.08* (0.05)		-0.08* (0.05)		-0.08* (0.05)	
Cooperation decision round 2		0.03 (0.05)		0.04 (0.05)		0.03 (0.05)	
Degree of Player (friends)			-0.03* (0.02)	-0.03* (0.02)			-0.03* (0.02)
Degree of Player (relatives)			0.04 (0.04)	0.04 (0.04)			0.03 (0.04)
Degree of Player (acquaintances)			-0.01 (0.02)	-0.01 (0.03)			-0.01 (0.02)
Voted in presidential elections (2006)					0.06** (0.03)	0.06** (0.03)	0.06** (0.03)
Always or usually help anyone with money, food or clothes					-0.07 (0.06)	-0.07 (0.06)	-0.07 (0.06)
Independent Variable	High	High	High	High	High	High	High
Beneficiary longer than a year (enrolment)	0.32*** (0.11)	0.33*** (0.12)	0.32*** (0.11)	0.34*** (0.12)	0.33*** (0.11)	0.34*** (0.12)	0.33*** (0.11)
Cooperation decision round 1		0.11* (0.07)		0.12* (0.07)		0.11* (0.07)	
Cooperation decision round 2		-0.05 (0.07)		-0.05 (0.07)		-0.04 (0.07)	
Degree of Player (friends)			0.04* (0.02)	0.05** (0.02)			0.04* (0.02)
Degree of Player (relatives)			-0.06 (0.05)	-0.06 (0.05)			-0.05 (0.05)
Degree of Player (acquaintances)			0.02 (0.03)	0.02 (0.04)			0.02 (0.03)
Voted in presidential elections (2006)					-0.08** (0.04)	-0.08** (0.04)	-0.08** (0.04)
Always or usually help anyone with money, food or clothes					0.10 (0.08)	0.10 (0.08)	0.10 (0.08)

Robust Standard errors that are clustered at the session level in parenthesis. * Significant at 10%; ** significant at 5%; *** significant at 1%. Change in the predicted probabilities of holding each attitude for an increase of one unit of each independent variable, while holding all other independent variables constant at their means.

We also explore how the decision to cooperate in rounds 1 and 2 is related to social capital measures³⁴. In

³⁴ To our knowledge the only evidence of positive correlation between behavior in the field and behavior in the lab (social capital related) in a PGG is Rustagi et al. (2010) on forest management activities and time spent on monitoring forest, De Oliveira et al. (2011) with amounts donated to neighborhood charities, Thoni et al. (2012) with survey measures on trust and fairness, and Barr et al. (2014) with elections on school authorities' accountability. With no correlation, Voors et al. (2011) with illegal commercial mining, logging, and hunting; illegal hunting of endangered species; support to forest conservation, Voors et al. (2012) with contribution to community

Table A4a and A4b in the appendix, we report this relation for continuous (i.e. number of EC meetings, percentage of ML in the session and connectivity measures) and dummy survey measures, respectively³⁵.

6. Other confounds

There are confounding factors that may affect the relation between the ability to coordinate as a measure of one dimension of social capital and the exposure to the program. In this section we will explore them.

Three elements lie at the core of social capital (James Samuel Coleman 1987; James S. Coleman 1988): coordination, cooperation and networks³⁶. Coordination and the social network determine the effectiveness of the social norms, as coordination reflects the ability to exploit Pareto-improving opportunities in the presence of uncertainty and the features of the social network provide the environment in which that ability is likely to emerge. The third element at the heart of social capital is the ability to overcome free-riding incentives in real-world situations (James S. Coleman 1988). These situations, especially salient among poor communities, share the same game-theoretic representation of a public goods game: in the process of building social capital, cooperative outcomes are subject to “free-riding”³⁷ incentives (James Samuel Coleman 1994).

and most CCTs have a component of new interactions among the beneficiaries within the communities that should lead to building or strengthening social ties (Putnam 1995) and enforcing pro-social norms. The main contribution of this paper is twofold. First

i. Measuring Willingness to Cooperate: a Public Goods game

38

The decision to exert the highest level of effort may be mediated by other-regarding preferences such as trust, altruism or reciprocity. For example, when people try to adopt a new norm, normative expectations may not be enough and individuals must also trust others to commit to the change. In fact, a player is aware that if she chooses the highest level of effort, any other player may obtain a higher payoff by deviating from that strategy. We use behavior in the Public Goods game as a proxy of such preferences. Specifications II, IIIb, IVb, IVd in Table 8 show that other-regarding preferences -measured as behavior in a cooperation game- is positively (negatively) related -although slightly significant- with a high (low) individual level of effort.

project fund for the village and Cardenas et al. (2013) with participation in any social organization; attendance to their meetings; participation in their decision planning and hours in a month spent in them.

³⁵ There is no relation between willingness to cooperate in the first round and traditional survey measures of social capital, with the exception of helping anyone with money, food or clothes, which constitutes altruistic behavior. The decision to cooperate in both rounds is positive and significantly related to the presence of at least one ML in the session. In contrast, we find that willingness to cooperate in the second round, which would measure not only an individual's preference to cooperate but also the effect of cheap talk, is positively related with declaring that the player (usually or always) helps others outside the household by offering the seat in the bus, carrying packages or groceries and taking care of the house or the children. Finally, willingness to cooperate is negatively related to attendance to the FA meetings.

³⁶ In their seminal work, Putnam et al. (1993):167 define social capital as those “features of social organization, such as trust, norms, and networks that can improve the efficiency of society by facilitating coordinated actions” (emphasis added). James S. Coleman (1988) was clear enough to define social capital by its function: “It is not a single entity but a variety of different entities, with two elements in common: they all consist of some aspect of social structures, and they facilitate certain actions of actors within the structure” (p. S98).

³⁷ See Samuelson (1954); Grossman and Hart (1980); Ostrom (1998); Olson (2009). Evidence on social program evaluations supports this claim (Adato et al. 2005; Fearon et al. 2009; Avdeenko and Gilligan 2014).

³⁸ Our Public Good game design has been used extensively in Colombia (Attanasio et al. 2009; Cardenas et al. 2013; Attanasio et al. 2015) and in other countries (Cardenas et al. 2013; Barr et al. 2014).

Second, we relate trust to cooperative behavior as other-regarding preferences whereas the literature has to a large extent focused on behavior in experimental trust games (For an extensive review see Thoni et al. (2012).

The Public Goods game is a Voluntary Contribution Mechanism (VCM). Other studies employ a dichotomous VCM game comparable to the one we use here: Attanasio et al. (2012) in 70 rural municipalities in Colombia, Cárdenas et al. (2013) in 6 Latin American cities, Barr et al. (2012) in Uganda, Barr et al. (2014) in Albania and Alzua et al. (2014) in Mali³⁹. The game captures the willingness to cooperate among the members of a group of 25 people by choosing simultaneously whether to allocate a token in the private account with a private benefit or to allocate the token in the group account, where the benefits of all members increases and the wellbeing of the entire group is improved⁴⁰. There is no incentive to invest in the group account due to a higher individual payoff by investing in the private account. The dominant strategy is not to contribute at all, undermining the socially optimal outcome. However, if all in the group invest their token in the private account, the group will be worse-off than if all the members invested in the group account, which is the social optimum. The situation constitutes a typical social dilemma.

The possibility of cooperation within a group is determined by multiple factors such as repetition, communication, punishments or rewards and inequality in the payments⁴¹. In our game, the incentives to invest in the group account are given by the specific features of the design, but also by the individual motivations concerning the group wellbeing (Attanasio et al. 2009; Attanasio et al. 2015): Other-regarding preferences such as altruism, trust, social distance from the other members, fairness, reciprocity, a sense of affiliation as a member of a common group, or sympathy toward others in the group determine social cohesion in a group and strengthen the ability of its members to cooperate and overcome collective action problems. In addition, community attributes such as social norms and institutions, informal enforcement mechanisms, concerns for social reputation, social reciprocity and group identification enforce the group interests over the individual, leading to attain a higher level of contribution and overcome the dilemma.

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 are allowed to discuss for ten minutes before making simultaneously their private, anonymous decision⁴². We use behavior in the second round as a measure of how effective the opportunity to communicate could be in increasing willingness to cooperate and solving a social dilemma in the community.

In Table 4 we report behavior in the Public Goods game and experimental characteristics at the session level. We also report differences across levels of exposure in these cooperation measures. First, though the unique Nash equilibrium of the game is for individuals to invest their token in the private account, many individuals deviate from the Nash equilibrium and contribute to the public good. Despite having a very low MPC and conducting the game in an urban context, the overall level of cooperation we observe in our sample is similar to that observed in similar labs in the field. However, the level of cooperation in the first round among the short exposure sample is significantly higher than in the long exposure one. In the second round, there is no significant difference in the cooperation variables. Finally, we observe that in the short exposure sample, the percentage of participants who had a perfect understanding of the Public Goods game was significantly higher. We would expect that cooperation should be higher in the Long exposure group than in the short exposure one. Attanasio et al. (2015) examine these intriguing effects by

³⁹ For more details on the experimental design see Section 2 in the appendix and on the role of willingness to cooperate on the measurement of social capital see Attanasio et al. (2009, 2015).

⁴⁰ The dichotomous VCM makes the game easily understood by subjects and also time effective.

⁴¹ See Attanasio et al. (2015) for a recent review.

⁴² Communication is completely unstructured and during the discussion, the players can talk about whatever they want but they cannot leave the room. No one, except the experimenter, knows the other players' contributions in the first round.

using a difference in difference regression analysis with data from 2007 and 2008, which controls for possible unobservable variables. They find that there was indeed a positive effect of the program in cooperation in the first round.

Table 4. Behavior in the Public Goods game

Level	Variable	All	Long Exposure	Short Exposure	Difference
Round 1	Average percentage of contributors	29 (0.4)	22 (0.4)	34 (0.5)	-12* (0.7)
	Percentage of sessions with no contribution	11 (0.6)	15 (1.0)	7 (0.6)	7 (1.1)
	Median percentage of contributors	10 (0.5)	0.0 (0.0)	17 (0.9)	-17* (0.9)
	Maximum percentage of contributors	89 (0.6)	85 (1.0)	93 (0.6)	-7 (1.1)
Round 2	Average percentage of contributors	27 (0.4)	26 (0.7)	29 (0.5)	-3 (0.8)
	Percentage of sessions with no contribution	14 (0.7)	23 (1.2)	7 (0.6)	16 (1.3)
	Median percentage of contributors	17 (0.7)	23 (1.2)	13 (0.8)	10 (1.4)
	Maximum percentage of contributors	86 (0.7)	77 (1.2)	93 (0.6)	-16 (1.3)
Session Level	Session size	24.65 (0.14)	24.74 (0.16)	24.58 (0.21)	0.16 (0.26)
	1 if the player understood that the best outcome is everyone investing in the group account	0.20 (0.02)	0.13 (0.03)	0.25 (0.02)	-0.12*** (0.04)
	1 if the player declares she understood everything	0.67 (0.02)	0.67 (0.04)	0.68 (0.03)	-0.01 (0.05)
Number of sessions		29	14	15	29

Robust Standard errors that are clustered at the session level in parenthesis. The standard errors for the median and maximum statistics are calculated at session level. * Significant at 10%; ** significant at 5%; *** significant at 1%.

ii. Network Information and the Environment: a CCT Program

There are many advantages of social networks in community life, from exchange of goods and services to the transmission of information, values and norms (Matthew O Jackson 2008) Networks are also important on effort individual decisions (Matthew O Jackson 2010; List and Rasul 2011) and the references therein for studies that use field experiments in combination with social network data). For example, friends may conform to a social norm and status may be a determinant of individual behavior (Bernheim 1994), individuals may be averse to inequality within the network (Fehr and Schmidt 1999; Charness and Rabin 2002).

Network structure becomes an important factor to take into consideration when overcoming collective action problems and constitute a key component of social capital's definition and measurement. The structure of the network, the position of individuals in and their degree it determine, to a great extent, if collective action is successful or not (Gould 1993; Matthew O Jackson and Watts 2002; Matthew O. Jackson et al. 2012)⁴³.

There is a wealth of theoretical work supported by extensive evidence in that lab on the

⁴³ For evidence of the structure of the social network and coordination games in the lab see Goyal and Vega-Redondo (2005); Cassar (2007); Matthew O Jackson (2008); Charness et al. (2014); Choi and Lee (2014).

coordination problem of collective action on costly links and how information in the structure of the network affects individual's decision to coordinate. However, there is no evidence from the field on how the network attributes of each individual (e.g. number of people known, family ties) explains individual effort decision in situations problems where individuals do not have a single action that constitutes a dominant strategy. To our knowledge this is the first study that looks at the relationship between individuals' features and their decision to coordinate. This would shed light in understanding the determinants of coordination in the field.

Finally, this study also contributes to the small but growing literature that conduct behavioral experiments with real-world leaders in a natural field setting (Attanasio et al. 2015; Jack and Recalde 2015; Kosfeld and Rustagi 2015; Polania-Reyes 2016).

In Table 6 we present the average number of friends, acquaintances and connections (the sum of relatives, friends and acquaintances) each participant reports in the session and within coordination group (i.e. A, participants with the highest connectivity score in the session and C, participants with the lowest score)⁴⁴. We also report features of the in-session network such as the friendship, acquaintanceship and connectivity densities (measured as the ratio of the total number of identified specific links in the session and the total possible number of specific links among connected people, i.e. those individuals that are identified as an acquaintance at least once by another player). In addition, we present a measure of leadership given by the percentage of players identified as an informal leader in each session (i.e. a person different to the ML), at least by one different player in the session. The fact that there are no statistical differences in terms of connectivity between levels of exposure indicates the recruitment process was successful.

Table 6. Network characteristics across sessions

Variable		All	Long Exposure	Short Exposure	Difference
Session level (714 obs.)	Average degree of relatives ^a	0.13	0.14	0.13	0.01
	Average degree of friends	1.46	1.46	1.46	-0.00
	Average degree of acquaintances	0.44	0.50	0.40	0.10
	Average degree of trustworthy players	1.50	1.48	1.52	-0.05
	Friendship density ^b	0.11	0.11	0.11	-0.00
	Acquaintanceship density	0.03	0.04	0.03	0.01
	Percentage of players identified as leader	0.18	0.20	0.16	0.04
	Score	5.38	5.45	5.32	0.13

Note: A player's degree is the number of edges or relationships the player declares to have within the session. Every player has a weighed measure of her degree of friends, degree of relatives and degree of trustworthy acquaintances. ^a Average degree for a network graph is the average number of edges that nodes in the network have. ^b Network density is the average degree divided by (N-1), where N is the number of nodes in the network. Robust standard errors of the difference clustered by session. For more details on the Network analysis see Advani and Malde (2014). * Significant at 10%; ** significant at 5%; *** significant at 1%.

Networks

A common limitation of most models of collective action is that they neglect that people can choose with whom they interact, which is known that is not random. Generally, people prefer to interact with people who are similar to them, and collective action is no exception. Empirical work has demonstrated that individuals who participate in collective action have more links to other participants than individuals who

⁴⁴ Table 6 also provides validity to the effectiveness of the score in allocating the most connected individuals into group A and the least connected in group C. We also find that the percentage of players identified as leaders is significantly lower in group C (15.9) than in group A (23.3, with a p-value of 0.00). Interestingly, the rate of reported leaders is significantly higher than the proportion of ML (participants who declared to have been elected FA beneficiary representatives) (5.2% and 5.1% respectively). We find that 46.2% among those identified as leaders in the session are MLs.

do not participate (Opp 1989).

In Table 8 specifications IIIa-IIIb the role of network information in the effort decision with and without cooperation. Regardless of the density of the network (i.e. number of friends, relatives and trustworthy acquaintances in the session are identified by the player), players who were enrolled into the program more than a year before chose the Pareto efficient level of effort (difference is significant at 1%). While holding all other independent variables constant at their means, those players with an exposure of more than a year and having friends were 35% and 5% more likely to choose the highest effort level, respectively. In addition, those players with an exposure of more than a year and having friends were 25% and 3% less likely to choose the lowest effort level, respectively. This evidence on features of the network is consistent with the literature.

Once we control for the network features (specification IIIb), the decision to cooperate is also positive (negative) and significant for those who choose the high (low) level of effort, respectively.

Other dimensions of social capital – Traditional survey measures

We include these relevant measures in specifications IVa-IVc in Table 8. Helping someone (which could be attributed to preferences for altruism) has the expected sign but is not significant: those who help others are more likely to exert more effort. However, voting behavior is positively related to the likelihood of choosing the lowest level of effort. This result is consistent with the literature of social capital which states that trust in formal institutions and the rule of law is related with a higher voter turnout in elections, whereas voter turnout rates in communities with a weak rule of law and relevance of informal institutions or social norms are lower.

Table 9, presents three specifications in which we control for participants' basic socio-economic characteristics, experimental variables at the session, group and individual level, and the factors we considered in Table 8.

Leadership

Social status is relevant in the creation and transmission of social norms (Richerson and Boyd 2008). In a coordination setting, a leader may have a strong influence on the equilibrium selection (Bala and Goyal 1998; Eckel and Wilson 2000, 2007). From Table 9, we find that only social capital measures related to the CCT program such as number of EC meetings and the percentage of ML in the session is significantly related to the level of effort. When including these measures in the analysis in specification VII (See Table 10 b) they don't affect the effort decision. For example, contrary to behavior from previous coordination games in the lab (Foss 2001; Gillet et al. 2011; Brandts et al. 2015) we don't find a relation between being a ML, or the presence of a ML in the group, and the effort decision.

iii. Basic demographics and wealth

We also consider the economic approach to social capital (Glaeser et al. 2002; Polania-Reyes 2005) and examine the role of socio-economic characteristics at household and individual level in the individual effort decision. Table 9 reports the effect of the exposure to the program on the effort decision, when controlling for these individual characteristics. Overall, the effect is consistent with our previous specifications.

Specifications V-VII in Table 10 report the marginal effects of different socio-economic dimensions. First it reports individual demographic characteristics such as being a woman, age, level of education, number of years living in the neighborhood, whether the player is displaced, is the head of the household, has a partner or is beneficiary of another program different from FA. Then it reports housing conditions such as the number of people per room, if the housing is owned, if the housing does have electricity, water pipe access and sewage. Finally it reports wealth measured as assets⁴⁵, household income and household perception of wealth with respect to other households in the neighborhood.

The only characteristics with significant marginal effects at both levels of effort are having a landline and the individual perception of wealth. Having a landline will increase the probability to choose

⁴⁵ The assets are landline, cellphone, sound-player and DVD player.

the lowest level of effort by 7% and decrease the probability of choosing the highest level of effort by 11%. This result would imply that having no land line would provide an incentive to strengthen their communication with others by more interactions or other means or the habit of effort with sometimes no reward by the player. In addition, an increasing perception of how rich is the household compared to others in the community will decrease the likelihood of the ability to coordinate.

—Table 9. Marginal effects of a partial proportional odds model for the lowest and highest individual level of effort

	V	VI	VII
Independent Variable	Low	Low	Low
Beneficiary longer than a year (enrolment)	-0.19*** (0.08)	-0.29*** (0.08)	-0.30*** (0.07)
Cooperation decision round 1			-0.06 (0.04)
Cooperation decision round 2			0.02 (0.05)
Degree of Player (friends)			-0.03** (0.02)
Degree of Player (relatives)			0.03 (0.04)
Degree of Player (acquaintances)			0.00 (0.03)
Independent Variable	High	High	High
Beneficiary longer than a year (enrolment)	0.27*** (0.11)	0.43*** (0.1)	0.45*** (0.1)
Cooperation decision round 1			0.09 (0.06)
Cooperation decision round 2			-0.03 (0.07)
Degree of Player (friends)			0.05** (0.03)
Degree of Player (relatives)			-0.05 (0.05)
Degree of Player (acquaintances)			0.00 (0.04)
Basic characteristics	Yes	Yes	Yes
Experimental variables	No	Yes	Yes
CCT measures of Social capital	No	No	Yes
Observations	712	712	712

Robust Standard errors that are clustered at the session level in parenthesis. * Significant at 10%; ** significant at 5%; *** significant at 1%.

iv. Experimental session variables

Specifications VI in Table 6.2 and Table 6.4 include session variables such as whether there is a man in the session, whether the player understood perfectly the coordination game, a dummy of one of the experimenters and the size of the session. In addition, given the possibility of contamination among subjects of different sessions since participants in a session could talk to participants of the next session on their way in. Despite, our effort in avoiding that kind of contamination effects in the field, we control for this possibility with the average level of effort in previous two sessions and a dummy whether that session was the first one on that day.

Table 10 a Control variables in Table 9 Marginal effects of a partial proportional odds model for the lowest and highest level of effort – Basic Characteristics

V	VI	VII	V	VI	VII
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Independent Variable	Low	Low	Low	High	High	High
1 if the player is a woman	-0.15 (0.15)	-0.07 (0.1)	-0.04 (0.11)	0.22 (0.21)	0.1 (0.15)	0.06 (0.16)
Age	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Level of education (0 to 5)	0.01 (0.01)	0.02* (0.01)	0.02 (0.01)	-0.02 (0.01)	-0.02* (0.01)	-0.03 (0.02)
Number of years living in the neighborhood	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
1 if the player is displaced (self-declared)	0.01 (0.05)	0.02 (0.05)	0.01 (0.05)	-0.02 (0.07)	-0.02 (0.07)	-0.02 (0.08)
1 if the player is the head of household	0.00 (0.03)	0.02 (0.03)	0.01 (0.03)	0.00 (0.04)	-0.03 (0.04)	-0.02 (0.05)
1 if the player has a partner	-0.03 (0.04)	-0.02 (0.04)	-0.02 (0.04)	0.05 (0.05)	0.02 (0.06)	0.03 (0.06)
Number of people per room	-0.01 (0.01)	-0.01 (0.01)	0.00 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
1 if the player has her own housing	-0.02 (0.03)	-0.02 (0.02)	-0.01 (0.03)	0.03 (0.04)	0.03 (0.04)	0.02 (0.04)
1 if the player's home has no electricity	-0.01 (0.07)	0.02 (0.07)	0.03 (0.06)	0.01 (0.1)	-0.02 (0.11)	-0.04 (0.09)
1 if the player has a landline	0.06** (0.03)	0.07** (0.03)	0.07** (0.03)	-0.09** (0.04)	-0.11** (0.05)	-0.11** (0.05)
1 if the player has a cellphone	-0.01 (0.03)	0.01 (0.03)	0.00 (0.03)	0.01 (0.04)	-0.02 (0.05)	-0.01 (0.05)
1 if the player's home has water pipe access	-0.07** (0.04)	-0.05 (0.03)	-0.06 (0.04)	0.11** (0.05)	0.08 (0.05)	0.09 (0.06)
1 if the player's home has sewage	0.02 (0.03)	-0.01 (0.03)	-0.01 (0.03)	-0.03 (0.04)	0.01 (0.05)	0.02 (0.05)
1 if She has received (different from FA) any other government aid	-0.02 (0.02)	-0.04 (0.03)	-0.03 (0.03)	0.03 (0.03)	0.06 (0.04)	0.04 (0.04)
1 if Perceives that HH income is above the highest possible	-0.33*** (0.1)	-0.25*** (0.07)	-0.06 (0.07)	0.1 (0.12)	0.01 (0.1)	0.09 (0.1)
1 if Perceives that HH income is above the average	-0.04 (0.06)	-0.01 (0.05)	-0.01 (0.05)	0.06 (0.08)	0.02 (0.08)	0.02 (0.08)
1 if the HH has a sound player	0.00 (0.03)	-0.01 (0.03)	0.00 (0.03)	0.00 (0.04)	0.01 (0.04)	0.00 (0.04)
HH income per capita	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
1 if the HH has a DVD player	0.01 (0.03)	0.01 (0.03)	0.01 (0.03)	-0.01 (0.05)	-0.01 (0.04)	-0.01 (0.04)
<i>Basic characteristics</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Experimental variables</i>	No	Yes	Yes	No	Yes	Yes
<i>CCT measures of social capital</i>	No	No	Yes	No	No	Yes
Observations	712	712	712	712	712	712

Robust Standard errors that are clustered at the session level in parenthesis. * Significant at 10%; ** 5%; *** 1%.

Table 10 b Control variables in Table 9 Marginal effects of a partial proportional odds model for the lowest and highest level of effort –Experimental variables and CCT measures of Social Capital

	VI	VII	VI	VII
Independent Variable	Low	Low	High	High
1 if there is at least one man in the group	0.09	0.12	-0.14	-0.18

	(0.09)	(0.09)	(0.13)	(0.14)
1 if the player understood the activity perfectly	-0.02	-0.02	0.02	0.02
	(0.02)	(0.03)	(0.04)	(0.04)
1 if Experimenter n°2 (female) in 2008	-0.18**	-0.17**	0.26**	0.26**
	(0.09)	(0.09)	(0.13)	(0.13)
Number of players in session	0.09**	0.08**	-0.13***	-0.13***
	(0.04)	(0.04)	(0.05)	(0.05)
1 if First session in the day	-0.03	-0.02	0.05	0.03
	(0.08)	(0.08)	(0.13)	(0.12)
Average level of effort in the last two sessions ^a	-0.1	-0.11	0.14	0.16
	(0.11)	(0.11)	(0.16)	(0.16)
1 if player is chosen as leader by anyone in the group		0.03		-0.05
		(0.05)		(0.08)
1 if player is a ML (self-declared)		-0.02		0.02
		(0.06)		(0.09)
1 if there is at least 1 ML in the group		-0.02		0.03
		(0.04)		(0.07)
<i>Basic characteristics</i>	Yes	Yes	Yes	Yes
<i>Experimental variables</i>	Yes	Yes	Yes	Yes
<i>CCT measures of social capital</i>	No	Yes	No	Yes
Observations	712	712	712	712

Robust Standard errors that are clustered at the session level in parenthesis. ^a Average deviation from the neighborhood mean of the average effort in the previous 2 sessions * Significant at 10%; ** significant at 5%; *** significant at 1%.

7. Capturing beliefs: a Quantal Response Non-Equilibrium approach

One of our main points is that the tradeoff between risk dominance and payoff dominance is directly linked to beliefs materializing as a social norm. In order to estimate the probabilities of choosing the most efficient effort level we estimate a Quantal Response Equilibrium (QRE) model (McKelvey and Palfrey, 1995, 1998)⁴⁶.

In a symmetric QRE, each player uses a mixed strategy, p , which itself induces a distribution p_{min} over the minimum effort of all opponents. The expected payoff from choosing $e_i \in \{1,2,3\}$ is thus given by

$$(3) \quad E[\pi(e_i, p_{min})] = 3 \sum_{k=1}^3 p_{min}(k) \left(1 + \min(k, e_i) - \frac{2}{3} e_i \right).$$

The QRE condition relates the probability of playing a given strategy to the relative advantage of the expected payoff. Using the conventional logit specification, the logit equilibrium is characterized by the following

$$(4) \quad p(e_i = j) = \frac{e^{\lambda E[\pi(j, p_{min})]}}{\sum_{k=1}^3 e^{\lambda E[\pi(k, p_{min})]}}$$

where $\lambda \in [0, \infty)$ captures the degree of payoff-maximizing behavior (a higher value of λ meaning more payoff responsiveness – less noise, and with $\lambda = 0$ the density function becomes uniform over its support and behavior becomes random).

Although we cannot give a closed-form solution for the QRE (due to the large number of players, see Anderson et al., 2001) we provide a numerical solution using a grid search. The QRE can be defined as the global minimum (of all $p = (p_1, p_2, p_3) \in [0,1]^3$) of the mean squared error function,

⁴⁶ The QRE model allows agents to make mistakes and assumes that agents take into account the possibility that others are making mistakes when drawing inferences from their actions. Since the ME game has three equally possible equilibria, we use this approach due to the different predictions it offers.

$$(5) \quad \left\| p(j) - \frac{e^{\lambda E[\pi(j, p_{min})]}}{\sum_{k=1}^3 e^{\lambda E[\pi(k, p_{min})]}} \right\|_2.$$

Figure A2 in the appendix presents the QRE along the dimension of p_3 as a function of λ . Despite that the limit point of the QRE as $\lambda \rightarrow \infty$ is the risk-dominant equilibrium, $p = (1, 0, 0)$, given that the cost is greater than $1/8$, we observe that there might be multiple equilibria in our model. Then we will abstract from the global equilibrium, which is not particularly helpful for our purposes. Instead we will consider local minima of (5), and more importantly how they depend on initial conditions (p^0) of the maximization routine. Pseudo-equilibria are defined as local minima of the mean squared error function in (6). Different initial conditions (beliefs, i.e. values of p^0) lead to different minimization regions, and hence different pseudo-equilibria. Initial conditions matter for a highly non-monotonic objective function, as the algorithm is easily stuck at a local optimum. We argue that this is an adequate proxy for the formation of beliefs and hence of the social norm⁴⁷. Though the QRE path might converge to the risk-dominant equilibrium, we want to understand under what initial conditions a high value of p_3 (the outcome probability of choosing the highest level of effort) is sustained in local equilibria.

We want to compare the effect of different initial conditions on the outcome, p_3 . Figure A3 in the appendix, shows that a high value of p_3 can be obtained for a very high initial condition p_3^0 ⁴⁸. Instead for a wide interval of initial conditions (i.e. $p_3 \leq 95\%$) the trend of the pseudo-QRE converges to that of the QRE, which is depicted in Figure A2. This is in line with our thesis that reaching the Pareto dominant equilibrium is a matter of social norms, captured by initial beliefs about other players' actions. If others are perceived to be very likely to play the Pareto dominant equilibrium such equilibrium is sustained⁴⁹. This approach enables us to evaluate the degree to which the theory explains behavior in the field.⁵⁰ An interesting discussion is that of the determinants of the rationality parameter that optimizes the solution to (5). Having estimated the pseudo-QRE that corresponds to each initial condition, we interact this initial condition with different attributes of the individual, in particular the level of exposure to the CCT program.

The first one we want to understand is the effect of exposure to the CCT program. To do so we compute the pseudo-QRE separately for the subsample with short exposure to the program from that with long exposure to it. We calibrate λ with the objective of minimizing the mean squared error (MSE) between the distribution of efforts observed within the sample and the one predicted from the pseudo-QRE using λ . Figure A5 presents the MSE as a function of λ for the two subsamples and the whole sample of beneficiaries of the CCT. In Table A6 in the appendix we present the calibrated λ for the two possible scenarios (low beliefs and high beliefs as initial conditions) and whether the long exposure and short exposure samples. From Figure A4 we find that having high beliefs on others choosing the highest level of effort is not enough if there isn't a $\lambda > 0.6$ in order to obtain convergence to the Pareto-dominant equilibrium. Figure 2 and Table A.6 show that only the long exposure group had such λ . Figure 3 compares two pseudo-equilibria: the one implied by a high initial belief (an initial condition of $p_3, p_3^0 = 95\%$) and the one implied by a low initial belief (an initial condition of $p_3, p_3^0 = 33.33\%$). We

⁴⁷ This approach is consistent with the assumption by Mailath (1998) and de Paula (2013) on the equilibrium selection mechanism for the econometric analysis of incomplete-information games with possibly many equilibria. "If an equilibrium is established as a mode of behavior by past play, custom, or culture, this equilibrium becomes a focal point for those involved. When observed games are drawn from a population that is culturally or geographically close, sharing similar norms and conventions, one would expect this assumption to be adequate." (de Paula, 2013:120)

⁴⁸ p_1^0 and p_2^0 are estimated optimally using a grid search.

⁴⁹ One concern of depending on the initial conditions of the system is the stability of the result. In order to understand this potential issue more carefully we look at various slices in our grid search, which we present in Figure A3: as the initial condition (p_3^0) increases, there is a transition from a trend towards 1 to fluctuation in the outcome value p_3 , after which a (more stable) different trend is achieved which stays at high values of p_3 .

⁵⁰ This approach is also used by Chen and Chen (2011) with a model of identity. They show that a salient group identity increases coordination on the Pareto superior outcome in the lab for a 2x2 ME game.

plot the model outcome for each of the two subsamples. In the panel b of Figure 3, we observe that the predicted equilibrium for individuals with long exposure is similar to the observed data. For those beneficiaries with short exposure, the actual data is very similar to the theoretical prediction. As seen in the previous section, the program effect on coordination is notable, which is captured by the difference in observed distributions across the two figures. Again, low initial conditions cannot generate a prediction that accurately matches the real distribution: high initial conditions are needed to do so.

Figure 2. MSE high initial beliefs $p_3^0 = 95\%$ vs low initial beliefs $p_3^0 = 33\%$

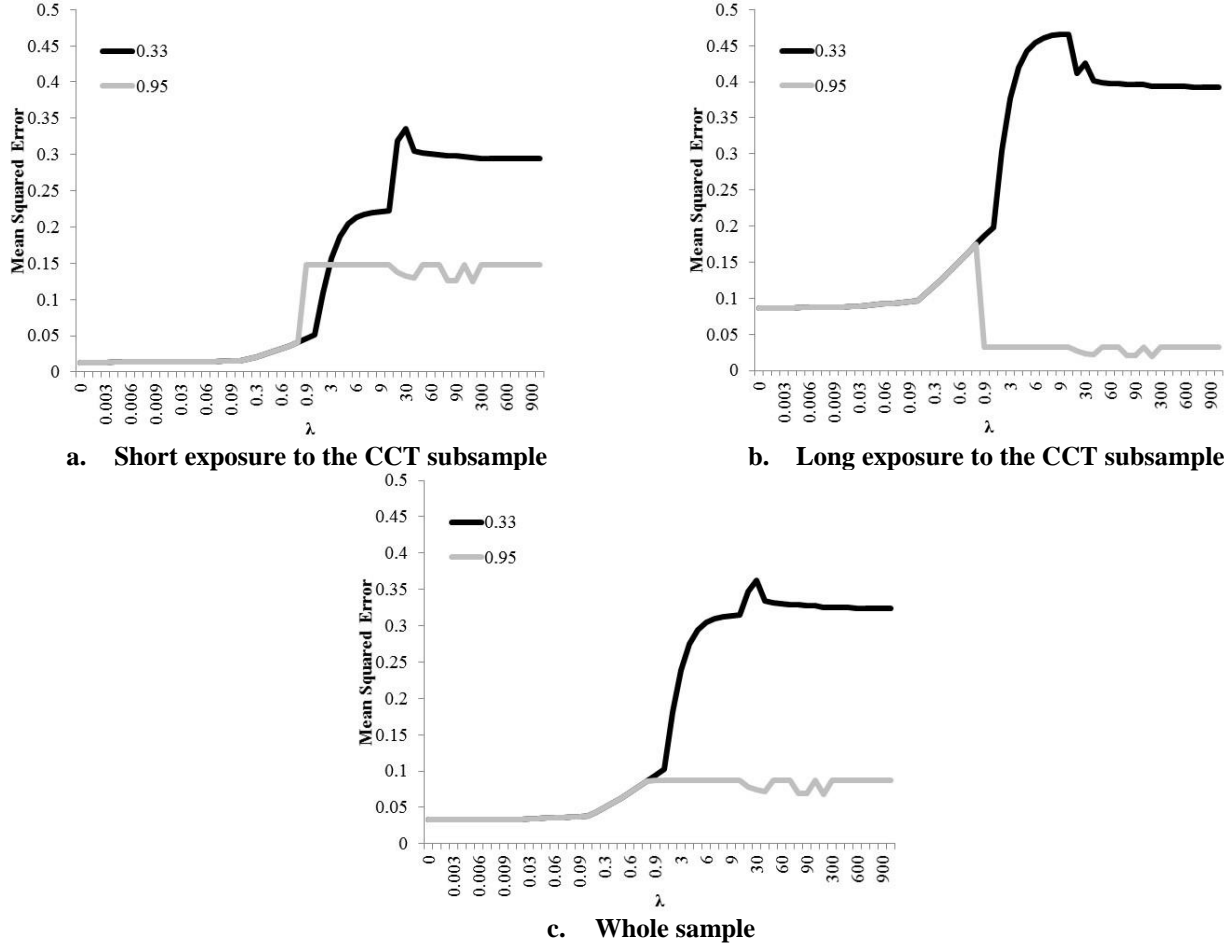
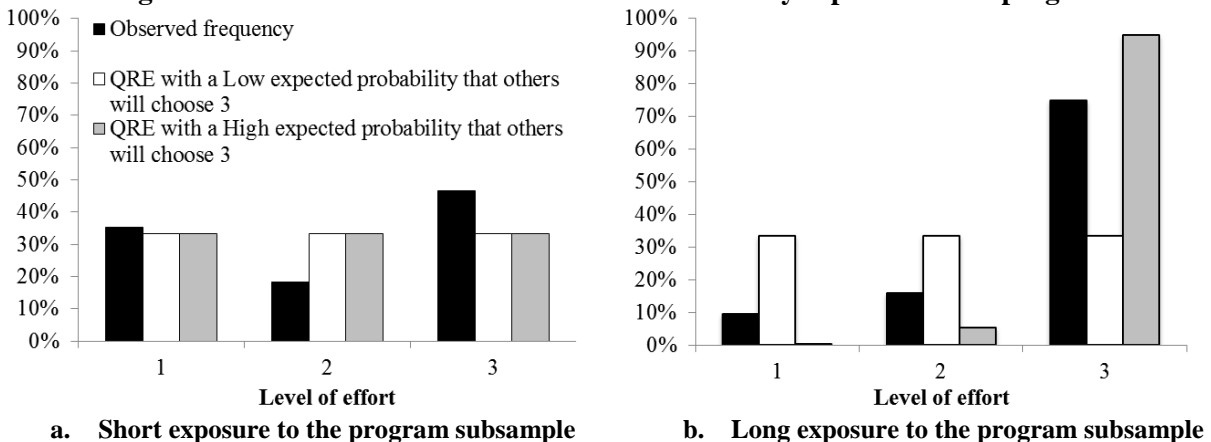


Figure 3. Predicted and realized effort distributions by exposure to the program



8. Concluding remarks

There is an increasing interest in measuring economic preferences using both choice experiments and surveys in order to identify relationships and causal effects of economic features related to prosocial behavior. However, the experimental literature in the field has focused entirely on the dimension of cooperation and trust, omitting coordination. The main contribution of this study is the use of a new experimental measure of beliefs in a coordination game with social networks.

Surveys record stated preferences while experiment outcomes provide revealed preferences. The experimental literature on economic experiments and surveys does not find a consistent answer on whether these two are positively correlated⁵¹. Our study is in line with the literature in this sense.

Our hypothesis is that coordination is strongly affected by a CCT program. We find a positive and significant relation between the individual effort decision and the exposure to a CCT program. This relationship is consistent when controlling for all possible confounding factors such as willingness to cooperate, wealth, and individuals' connections within the session. We also find that the degree of friends in the network is key to the ability to coordinate on the Pareto-efficient equilibrium⁵².

Unfortunately our study is only a quasi-experiment, establishing the relation (but not the causation) between exposure to the program and ability to coordinate on the most efficient equilibrium. We do find the relation to be robust to controlling for potential confounding factors.

We use a Quantal Response Equilibrium approach to support beliefs as the equilibrium selection mechanism. The most important question to ask about norms is what system of beliefs supports and defines norms. Once we understand these beliefs, we can tell whether the behaviors that we observe are norm-driven or not, measure the consistency between beliefs and behavior under different conditions, and make predictions about future behaviors (Bicchieri, 2014). We find that the theoretical prediction for long exposure beneficiaries is similar to the observed data⁵³.

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9. References

⁵¹ On one hand Gächter et al. (2004) and Capra et al. (2008) find a positive correlation between stated and revealed preferences in the public goods game and trust game. On the other hand Cardenas et al. (2013) find no evidence of correlation between participation in a charity and contribution in a public goods game.

⁵² Table A.3 in the appendix complements our analysis. We find a positive relation between exposure to the program and participation in neighborhood and program meetings as well as voting in presidential elections and participating in bonding and bridging associations (as defined by Woolcock, 1998).

⁵³ An interesting addition could be to use the QRE approach and estimate a structural model using a group-contingent social preference model where an agent maximizes a weighted sum of her own and others' payoffs, with weighting dependent on a group category of the other players ((R. Chen and Chen 2011; McLeish and Oxoby 2011; Y. Chen et al. 2014). Those beneficiaries who have been exposed for a longer time are able to identify themselves as a group and behave 'altruistically' towards one another.

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