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Government Intervention and Collective Action: Induced Interaction Can Build Coordination

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Abstract

Using a minimum effort game at the onset of a conditional cash transfer in Colombia, we document that increasing exposure time to the intervention is associated with a higher (lower) probability of beneficiaries choosing high (low) effort. We argue that program-induced links between beneficiaries gives rise to a coordination device, which is not mediated by kinship or friendship. Willingness to cooperate does not drive coordination, so the program-induced interaction affects individual expectations and not players' preferences. However, structural estimates about the level of expectations needed to sustain high effort raise a word of caution about the long-run effect of the intervention.

Keywords: coordination, conditional cash transfer, quantal response equilibrium, level-k.

JEL Codes: C92, D91, D78, D83, Z13.

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1 Introduction

Can a government intervention elicit collective action? Coordination failures pose a threat to economic development (Banerjee and Duflo, 2005), create poverty traps (Kraay and McKenzie, 2014) and hinder economic growth (Cooper and John, 1988). Coordination can foster development, build efficient institutions and avoid conflict (Matsuyama, 1997; Hoff and Stiglitz, 2001; Bowles, 2004). Even as governments are redesigning social welfare interventions to actively foster collective action among beneficiaries (Gallego and Polanía-Reyes, 2021), there is no quantitative evidence that they can deliver on such goal. We study the efficiency of coordination among beneficiaries of a large scale conditional cash transfer (CCT) program in Colombia.

The economic implications of cash transfers to low income households have been extensively studied (Millán et al., 2019; Ladhani and Sitter, 2020). Because such programs spend a significant fraction of national GDP, and affect a sizeable share of the population, they have a broader impact beyond the cash expenditure, including general equilibrium effects (Parker and Todd, 2017). But despite the potential social impact of these interventions (Valencia Lomelí, 2008), only one quantitative study so far addresses their social capital implications (Attanasio et al., 2015). We study the efficiency of coordination, which is an important condition for economic development (North, 1990), at the onset of the CCT *Familias en Acción* (FA).

Coordination failures arise when individuals deciding whether to invest high effort face strategic uncertainty and select a risk-dominant, but inefficient, equilibrium. This paper informs the question of equilibrium selection in a minimum-effort game. Despite a wealth of studies on the role of conditioning factors (Alonso et al., 2008; Sakovics and Steiner, 2012; Weber, 2006) and the potential benefits of policy intervention (Bhalotra et al., 2021), the extent to which public policy can drive efficient coordination remains an open question. Our evidence suggests that longer CCT exposure is linked to higher levels of coordination, whereby players select the efficient outcome. We argue that program-induced interaction created a coordination device of communication

(Blume and Ortmann, 2007) among beneficiaries.

We leverage the lab-in-the-field experiment by Attanasio et al. (2015), conducted at the onset of FA, to measure its on coordination. We follow the identification strategy by Almås et al. (2018), taking advantage of the staggered rollout across Cartagena, the city where FA was first piloted and implemented. Pilot and implementation locations were chosen at random among eligible neighborhoods. When we conducted our games, treated participants had been in the program for three years. Using a partial proportional odds model for the lowest and highest levels of effort, respectively, we find that the long exposure (treated) population were 45% more likely to choose the high effort action than the short exposure participants, an outstanding level compared to other studies Engelmann and Normann (2010).

Our baseline results follow a one-year cutoff to categorize short and long exposure participants, but the results are confirmed by marginal estimates of the effect of each additional months in the program. Running a similar specification on the combined sample, with fixed effects for months in the program, we find that the probability of exerting high (low) effort is increasing (decreasing) in the number of months a given beneficiary has been exposed to the program. This constitutes additional evidence that length of exposure is not proxying for another variable that may differ across locations. In other words, the evidence on the gradual effect of the program over time strongly contests the hypothesis that geographic selection explains our findings.

CCT beneficiaries are exposed to regular interactions with local program officials and community leaders but, more importantly, with other beneficiary neighbors. This, we argue, is what creates the coordination device. The main conceptual challenge consists in understanding the device, which could work either through preferences or beliefs. A pure coordination game entails a problem of strategic uncertainty, making beliefs the key object of interest. However, if agents have prosocial (or antisocial) motives, this could motivate them to exert a given level of effort irrespective of beliefs about other players'. To control for other-regarding preferences —altruism, inequality aversion, and efficiency concerns— we use a binary public goods game. We find that social preferences do not determine players' ability to coordinate. Thus, the coordination device works through expectations, not through preferences.

Network connections can improve cooperation (Chandrasekhar et al., 2018), risk sharing (Ligon and Schechter, 2012) and investment (Jakiela and Ozier, 2016). The question is whether the links induced by the CCT matter vis-á-vis the beneficiaries' preexisting connections. Because this is only one network layer our subjects belong to, the identification challenge lies in controling for other network layers. We allocate players into groups of high, medium and low network density, measured by presence of family, friends and acquaintances in the group. We find that our result is robust to controlling for such links.

Because preferences do not explain the results, any selection concern must relate to a bias linked to individual expectations. Expectations about others are conditioned by how well we know them, so we argue that any form of selection will become manifest through network connections such as family, friends and even acquaintances. We find that network depth measures are statistically indifferent across the long and short exposure samples, and conclude that selection cannot explain our findings. Overall, the coordination device we uncover does not stem from prior network links but rather from those induced by the intervention.

In the last part of the paper, we explore the robustness of high effort in the face of strategic uncertainty. Bardsley and Ule (2017) categorize coordination devices into three types: psychological salience, response to randomisation and team reasoning. The first one is about equilibrium selection, while the other two draw from cognitive hierarchy models (Camerer et al., 2004). Having argued that FA-induced links give rise to a coordination device, one that operates through expectations, the question is to what extent player expectations can accomodate either a cognitive hierarchy or an equilibrium condition. Using both approaches, we assess whether the observed frequency of high effort in the treated sample passes a hurdle where high effort is now individually optimal.

Coordination games present a useful, incentivized, way to identify social norms (Krupka and Weber, 2013). More simply, they can be used to derive first order expectations about other players' behavior. We derive an implied measure from a level k model where each subject's decisions follow one of a small set of a priori plausible types, with error. Level 0 types behave randomly, following a probability distribution $((1-p_H)/2, (1-p_H)/2, p_H)$ characterized by the probability p_H of exerting high effort. Level k types best-respond to level $k-1$ ones, for each k. We characterize the probability $p_H \geq 95\%$ that sustains high effort as the dominant strategy for level 1 types and higher.[1] This threshold is higher than the realized frequency of high effort among the long exposure sample at 74%. We see this 21% gap as a word of caution about the robustness of our coordination device in a cognitive hierarchy setting.

The empirical results do pose a puzzle: a priori deep connections like family and friends do not make coordination more efficient, while arguably shallower ones induced by the CCT do the job. We discuss this from a perspective of quantal response equilibrium (QRE) (McKelvey and Palfrey, 1995). Depending on the value of the parameter governing the payoff-sensitivity (or rationality) of players, λ, the QRE may or may not support the efficient outcome. As λ increases, the equilibrium correspondence forks out to accommodate a Pareto-dominant branch, but eventually it collapses back to only the risk-dominant outcome. The structural results highlight the cautionary note raised by the level k-implied probability hurdle. At the same time, the fact that efficient coordination arises for intermediate values of λ, where others are afforded a "benefit of error", but not for high values, where that benefit disappears. Friends and family might beyond a benefit of error threshold, while fellow beneficiaries may lie within its boundaries.

Team reasoning and efficient coordination can arise in the presence of group identity Chen and Chen (2011). Among drivers of efficient coordination, Weber (2006) looks at the growth process of the set of players. Sakovics and Steiner (2012) consider pivotal players, and Attanasio et al. (2015); Jack and Recalde (2015) and Kosfeld and Rustagi (2015) look at leaders. We find that the

[1]Because any diagonal element in the payoff matrix is a Nash equilibria, higher level types behave the same as level 1. Thus, we can assume all players are level 1 and use the data to pin down the corresponding level 0-distribution.

presence of a recognized leader among the group does not raise individual effort. More closely related to our study are Blume and Ortmann (2007) and Ellingsen and Östling (2010), who examine the role of induced communication among inexperienced players. We provide empirical evidence of a government intervention creating a coordination device among program beneficiaries via shared institutional framework, participation in plenary (quarterly) assembly meetings and local (monthly) meetings.

Ours is not the first paper to take advantage of the comparability of beneficiaries across zones and of the random allocation. We follow the identification strategy by Attanasio et al. (2015) and Almås et al. (2018), who use quasi-experimental variation to capture the intensive margin of the program's effect (between the short and long exposure participants, in our case).[2] We argue that selection cannot explain our results. Participants in the long exposure neighborhood had been living there for significantly less time than those in the short exposure sample, so any unobservable dimensions of social capital affecting coordination would work in favor of the short exposure participants. Thus, the estimates we derive are likely to be a lower bound of the effect.

The paper is organized as follows. Section 2 introduces the institutional setting to develop our main hypothesis. Section 3 describes the experimental setting. Section 4 describes our data. Section 5 quantifies the relationship between the CCT and the ability to coordinate. Section 6 presents the structural framework to elicit expectations and assess the extent to which exposure to the CCT creates an equilibrium selection mechanism. The last section concludes.

2 Induced interaction and coordination

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. *Familias en Acción* was introduced to reduce extreme poverty in the medium term by providing resources to improve nu-

[2] Pre-analysis plans did not exist in 2008 when we conducted the study. Our conceptual framework follows Attanasio et al. (2009) and Attanasio et al. (2015).

trition, health status, and school enrollment of children from households in level 1 of SISBEN.[3] FA has been successful on its target outcomes, as well as broader social measures such as crime and voting (Attanasio et al., 2015).

FA started in 2002 in 627 small rural areas. After its initial success in rural areas, the national authorities decided to pilot the program in an urban zone starting in January 2005. The central government chose Cartagena, the fifth largest city in Colombia.[4] It is the third poorest city in the country, with 40.2% poor and 6.9% in extreme poverty in 2008 (MESEP, 2012). The national government staggered the implementation of the CCT program across time and neighborhoods, with no intervention of the local office. The roll-out randomly assigned zones in Cartagena to the program, so that the program design is very unlikely to cause selection into treatment.

The entire pilot zone, Pozón, was given access to the program in 2005. Participants from other zones had access to the intervention from 2007 onward. Between 2005 and the first half of 2007, the program operated in Pozón but had not been implemented in other zones, despite those being eligible to participate. In late August 2007, the program expanded to all urban areas in the country to eventually include 1.5 million beneficiary households.[5] After 2005, a new wave of enrollments opened in Pozón (for families newly eligible due to e.g. recent births) which creates variation in exposure length.

Government institutions are likely to enable individual identity (Glynn, 2008). In our setting, officials and beneficiaries of *Familias en Acción* perceive the social component to be an important feature of the program. We argue that the program sets a twofold coordination device. First, beneficiaries are

[3]The health and nutrition grant, roughly equal to USD19, is independent of family size. It is conditioned on regular attendance to medical check-ups for children (including vaccinations) and a number of tutorials on hygiene, diet and contraception for the mothers. The educational grants, aimed at households with children aged seven to seventeen, are conditional on enrollment and regular attendance in school. Each child in primary (secondary) school entitles the household to about USD5 (USD10) per month. Households receive a total transfer of 5% to 16% of the minimum wage, which represents between 10% and 30% of the average income of poor households (DNP, 2010; MESEP, 2012).

[4]In 2008, the population was 993,000 inhabitants.

[5]Familias en Acción made the first payment in Pozón in March 2005, followed by a bi-monthly payment. The first payment in Ciénaga was in October 2007.

likely to derive a sense of identification from common exposure to the same paperwork load, health check-ups and even payment logistics. Second, the program induces sustained interaction. A general assembly, organized quarterly by the governmental office, informs beneficiaries about logistics and gives them the opportunity to offer feedback about their experience with the CCT.

At their general assembly, the beneficiaries elect a representative called Mother Leader [*Madre Líder*] who is the point of contact between the beneficiares and the local office. More frequent local meetings, called Care Follow-up Meetings (EC) [*Encuentros de Cuidado*], are organized by the ML. Although attendance to these local meetings is not compulsory to receive the transfer, most beneficiaries participate at ECs where, in addition to discussing health or human capital specific issues, they have the chance to talk to one another, under the institutional umbrella of the program. The meetings were presented as key for human capital investment. The number of ECs is determined by the proactivity of the corresponding ML, but the local FA office made it compulsory to attend the meetings between 2005 and 2010.

Identity is not univocal, and each beneficiary may identify with many other groups tied to others kinds of meetings, including community events and religious activities. If these events and activities are sufficiently important, we expect that they will accrue into three types of links: family, friends and acquaintances. To understand how powerful the CCT-induced links can be relative to these other layers of individual identity, we use the above mentioned network links as a control. What matters for coordination is not the individual stock of social capital, which is effectively left behind when the participant enters our lab-in-the-field session. What matters for the session is the connections with the fellow participants who are present, not friends or fellow participants who are absent from it. That is precisely what we control for in our network treatment.

While we hypothesize that the program may have improved the structure of social relationships among beneficiaries, the possibility remains that it actually compromised the preexisting structure of social relationships between beneficiaries and non-beneficiaries. First, beneficiaries have less time to spend with non-beneficiaries if some of their time is taken up by the program meetings. Second, the new membership itself could erode trust in friends and family. Positive expectations about other players' behavior could be affected in the process, resulting in lower total earnings, especially for players exerting high levels of effort. If instead such earnings are higher, then the new links formed are not indicative of relationship erosion, but rather of a sense of belonging tied to program-induced repeated interaction.

Group identity matters for economic behavior in general (Akerlof and Kranton, 2000), and especially for coordination (Chen and Chen, 2011). We argue that a large scale, permanent, government intervention such as FA may lead to a layer of group identification. The survey by Valencia Lomelí (2008) conclude that belonging to a CCT program does not entail social stigma, and is instead likely to strengthen social relations. FA beneficiaries share a common institutional framework, annual assembly and EC meetings, including the election of the ML. For these reasons, we argue that the program is prone to generating a sense of shared identity among beneficiaries, sufficient to generate a coordination device, this sense of identity being mostly the result of repeated interaction.

3 Coordination, networks, and cooperation

3.1 The minimum effort coordination (ME) game

Many economic and organizational contexts feature situations where the worst component of a product or process determines the overall quality (Camerer and Knez, 1994; Foss, 2001; Brandts and Cooper, 2006). We use an adaptation of the weak-link coordination game by Van Huyck et al. (1990), which has been used extensively in the lab (Cooper, 1999; Portes and Landolt, 2000; Devetag and Ortmann, 2007) and recently in the field (Bhalotra et al., 2021). We reduce the strategy space to 3 choices for maximum simplicity while preserving the core tension between risk dominance and Pareto dominance.[6] An individual's payoff depends on her effort, as well as on the minimum effort of the group:

$$\pi_i^{ME} = \pi(e_i, e_{-i}) = 3 + 3\min(e_1, \ldots, e_8) - 2e_i \tag{1}$$

The vector e_{-i} denotes other players' levels of effort.[7] Players simultaneously determine their level of effort in order to maximize their expected payoff, given by equation (1). Any common level of effort $e_1 = \cdots = e_8$, i.e. all diagonal elements in the payoff matrix given in Table 6, is a Nash equilibrium. Players face a single problem: to guess what the minimum among the rest of the players is, and mimic that minimum effort.

Equilibria are Pareto ranked, with high effort for all players being the efficient outcome. Such effort is nevertheless risky because effort is costly and the payoff is dependent on even a single player deviating. The presence of strategic uncertainty in this game creates a wedge between the risk dominant outcome, which is safe but inefficient, and the payoff dominant one, which is efficient but fragile. In fact, ample experimental evidence suggests the risk-dominant equilibrium is favored in the long run. This coordination failure (Van Huyck et al., 1990; Anderson et al., 2001; Camerer, 2003) can take hold unless a coordination device (Bowles, 2004) is in place.

There is ample lab-based evidence on coordination devices, including 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 players' 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,

[6] Groups are composed of 8 players following the design by Attanasio et al. (2015). Their VCM group size is 24 players, and each group includes 3 network density treatment for a total of 8 players per group, grouped by network density.

[7] The use of the word "effort" is standard in the application of this type of games (Van Huyck et al., 1990). Though the players are in fact contributing money, use of the term "effort" allows an accurate replication of the game.

2005; Brandts and Cooper, 2006, 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) and subject-pool characteristics (Dufwenberg and Gneezy, 2005; Engelmann and Normann, 2010; Chen et al., 2014; Stoddard and Leibbrandt, 2014). We find strong evidence that FA sets a coordination device.

We argue that the coordination device operates similarly to Berninghaus and Ehrhart (2001) and Weber (2006). Beneficiaries will only exert high effort if they believe that everyone else will conform to that effort. We document that exposure to the program induces significant interaction among beneficiaries over time. We posit this can change individual expectations about others' behavior and set a precedent of mutual understanding (Ellingsen and Östling, 2010). The program's meetings facilitate communication which can make efficient coordination a focal point (Blume and Ortmann, 2007; Choi and Lee, 2014). In the repeated encounters, people have an opportunity to learn about others' behavior, enabling a pattern of reciprocity that minimizes the likelihood of misperception (Sugden, 2003). Overall, beneficiaries may derive a sense of identity from the program (Tajfel, 1982; Akerlof and Kranton, 2000; Chen and Chen, 2011) as "Families in Action" with power to act together (Warren, 1998; Sugden, 2000).

There are two features of social structures in particular that may facilitate coordination (Coleman, 1988): networks and other-regarding preferences —altruism, inequality aversion, and efficiency concerns—. First, the social network may reduce strategic uncertainty via risk attitudes. Second, motives to help or benefit others could lead to exerting high effort regardless of strategic uncertainty. In the remainder of this section, we describe our measures of network degree and of social preferences.

3.2 Group allocation using network data

There are many advantages of social networks in community life, from exchange of goods and services to the transmission of information, values and norms (Jackson, 2008).[8] Friends may conform to a social norm and status may be a determinant of individual behavior (Bernheim, 1994). Individuals may also be more inequity averse within their network (Fehr and Schmidt, 1999; Charness and Rabin, 2002).

Thus, network structure becomes an important factor to take into consideration when studying collective action problems. There is a wealth of theoretical work supported by extensive evidence in the lab on coordination failures and network features including structure, the position of the player in it and their degree of participation (Gould, 1993; Jackson and Watts, 2002; Jackson et al., 2012). For evidence of the structure of the social network and coordination games in the lab see Goyal and Vega-Redondo (2005); Cassar (2007); Jackson (2008); Charness et al. (2014) and Choi and Lee (2014).

A typical limitation of most models of collective action is that they neglect that people can choose with whom they interact, so network attributes are not random. Generally, people prefer to interact with those 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 do not participate (Opp, 1989). In our setting, the CCT may improve the structure of social relationships among beneficiaries (Putnam, 1995; Goyal and Vega-Redondo, 2005; Cassar, 2007; Jackson, 2008; Charness et al., 2014) by exogenously influencing the network.

In our experiment, each player was asked about her relationship with all the other players: relative, friend, acquaintance or unknown. In addition, we asked whether she perceived the given (known) person to be trustworthy. As FA may promote leadership (Latham and Saari, 1979; Bass, 1991; Foss, 2001; Brandts et al., 2007; Cartwright et al., 2013), we also asked the player to choose who would be considered as a leader in the community among the experimental session. Having mapped the relationship matrix among players, we built a connectivity score: 3 points for each friend and relative, 2 points for each trustworthy acquaintance and 1 point for each untrustworthy acquaintance.

[8]See Jackson (2010); List and Rasul (2011) and the references therein for studies that use field experiments in combination with social network data.

We allocated participants into three different groups: group H, with the eight highest scores, the most dense cluster; group L, with the eight lowest scores, the least dense cluster; group M grouped the remaining players. [9]

3.3 Other-regarding preferences

If an individual believes that everyone else is choosing maximum effort in the game, it is in her self-interest to also choose maximum effort. if others choose a different level of effort, the best reply is to exactly mimic others' behavior. The sense of "shirking" that features prominently in social dilemmas is absent from a pure coordination game. Still, other-regarding preferences may motivate an individual to choose high effort. We tease out the role of other-regarding preferences from that of expectations using a public goods game (also called voluntary contribution mechanism). Our design induces a low marginal propensity to contributing (.08). Moreover, we conducted the game in an urban setting, which is often characterized by low contributions.

In our public good game (PGG), each participant is given a token and decides whether to invest it in a group account or in a private account. The decisions are private and simultaneous. If an individual invests in the group account, she receives

$$E_i^G = 0.4 + 0.4 N_{-i}^G,$$

where E_i^G indicates the earnings of individual i from investing in the group account, and N_{-i}^G indicates the total number of other participants who invest

[9] Formally, let $R = (r_{ij})_{i,j=1,..,N}$ an $N \times N$ matrix of self-reported connectivity among players in a session of N participants, $y_k = (y_{ki})_{i=1,...N}$ an $N \times 1$ vector with binary elements $y_{ki} = 1$ if player i belongs to group k or 0 otherwise. We chose $(y_k)_{k=H,M,L}$ to maximize $Z_H - Z_L$ subject to

$$\begin{aligned} Z_H &= y_H' R y_H \\ Z_L &= y_L' R y_L \\ \sum_i y_{ki} &= 8 \text{ for } k = H, L \\ \sum_{k=H,M,L} y_{ki} &= 1 \text{ for each } i = 1, .., N \end{aligned} \tag{2}$$

in the group account. If she invests in the private account, she receives

$$E_i^P = 5 + 0.4N_{-i}^G.$$

The dominant strategy is to invest everything into the private account, 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.[10]

A PGG is a combined measure of altruism (i.e. unconditional cooperation) and conditional cooperation (i.e. willingness to cooperate conditional on the expectations about others' decision). In the PGG, any deviation from the self-regarding Nash equilibrium strategy entails a reduction of the individual payoff regardless of the expectations about other's decision.[11] In other words, it is optimal for an individual to shirk regardless of what others do. The uniqueness of equilibrium makes the PGG a clear measure of social preferences.

4 Data and experimental procedures

4.1 Experimental procedures

Our sample is based on the second stage of the lab-in-the-field experiment conducted by Attanasio et al. (2015) between 2007 and 2008. A randomly selected 1,000 participants from the FA beneficiary list were directly invited by the program office through their ML, out of which we obtain our sample of 714 participants. These come from Pozón, where beneficiaries were enrolled in 2005 (i.e. long exposure to the program) and other zones in the city, where

[10]Participants play the PGG a second time, but we only use the results of the first round. 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 can talk for ten minutes before making simultaneously their private, anonymous decisions. Communication is completely unstructured: 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.

[11]We note that a dictator game, which is widely used in other settings, can measure generosity but not cooperation.

beneficiaries were enrolled in 2007 (i.e. short exposure to the program).[12] In 2008, a total of 47 sessions were conducted, 21 in Pozón and 26 in Ciénaga.[13]

After collecting participants' identification documents and checking their names on the recruitment lists, subjects in each session were given a random identification number and seated in a semi-circle in a classroom where the instructions of the VCM game described above were read and explained. After they played the two rounds of the VCM, we collected a network questionnaire on the existing relationships among them while they had a snack.

Having collected the individual network data, we sorted them by network density and proceeded with the coordination game. An experimenter read and explained the instructions of the coordination game. Once we made sure the participants had understood the game, subjects formed three circles, back facing, in a different classroom. They proceeded with their decision, simultaneously and without communication. An experimenter announced the results to each group in private. Finally, the participants answered a survey.[14]

4.2 Participants' socio-economic characteristics

The government effected a random allocation of neighborhoods to the staggered intervention. Because of that, the samples coincide almost exactly with the limits of Pozón (long exposure) and other zones (short exposure), apart from 41 observations from Pozón that were subject to short exposure. This is due to new households in Pozón that became beneficiaries in the 2007 urban expansion. This section presents evidence on the comparability of samples in

[12] Compared to our expected response rate of 70%, we received a high turnout.

[13] IRB approval was obtained from the Colombian Department of National Planning (in charge of Familias en Acción). All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1964 and its later amendments. Informed consent was obtained from all patients for being included in the study.

[14] All recruited people received a show-up fee of USD1.1, to induce credibility and subsidize their transportation from and to their home or workplace. A session lasted two hours on average. Participants received their earnings based on the decisions in the experiments after the questionnaire. On average a participant earned USD10.04 (COP$17,595), which just over the value of the daily minimum wage. The daily minimum wage was COP$15,383 in 2008. Source: www.banrep.gov.co

each zone, by testing for difference in observables that could indicate selection.

Table 1 reports sample characteristics at the individual and household level by length of exposure. There are some differences across samples, but the difference across samples does not tell a univocal story supporting selection on observables. Participants enrolled in the program for more than a year are more likely to own their house but their house is more crowded, and its floor is more likely to be dirt. They have less years of education but are more likely to own durables. They have received the CCT for longer, but their income is not significantly different. Overall, selection on income-related or asset-related observables is not likely.

The CCT is insufficient to drive up incomes and assets, but likely sufficient to purchase affordable durables that may confound program-induced links. In particular, long exposure participants are more likely to own both a cell phone and a sound player, both of which can give rise to more social interaction (better means to communicate and to host social gatherings, respectively). If that is the case, their effect can only operate via the relationship links discussed above (family, friends and acquaintances). To the extent that we adequately capture network effects, we argue that selection on these observables is unlikely to explain our findings.

The residual concern is selection on unobservables. Participants from Pozón could be subject to stronger social networks or another type of connections not induced by FA. There are two key potential concerns: the long exposure sample sees a lower percentage of women heads of household (this variable being negatively correlated with being married, as the summary statistics imply) and less time in their neighborhood. The first concern is that women heads of household are more prone to coordination failures than men-heads. While there is no evidence supporting this hypothesis, this difference actually alleviates the concern of selection toward women-heads because we see the opposite. We partially take into account gender dynamics by controlling for presence of a man in the group.

For the second one, we conjecture that people who have lived longer in a given location are more prone to growing both a richer stock of social capital,

Table 1: Participant socioeconomic characteristics by time of exposure

	Exogenous Variable	All	Exposure		Difference
			Long	Short	
General	Percentage of female participants	98.5	99.0	98.0	1.0
	Average age (years)	36.2	36.8	35.8	1.1
	Years living in the zone	18.5	14.9	21.2	-6.3***
	Displaced	13.3	17.4	10.3	7.1**
	Household head	33.1	23.9	39.9	-15.9***
	Single	11.3	10.5	12.0	-1.5
	Married or civil partnership	72.1	78.0	67.7	10.3**
Education	None (level 0)	2.5	2.3	2.7	-0.4
	Primary incomplete (level 1)	21.0	22.0	20.3	1.7
	Primary complete (level 2)	14.3	16.1	13.0	3.1
	Secondary incomplete (level 3)	32.9	35.1	31.3	3.8
	Secondary complete (level 4)	20.0	16.4	22.7	-6.3*
	Over secondary (level 5)	9.2	8.2	10.0	-1.8
Income	Unemployed	4.3	3.3	5.1	-1.9
	With access to credit	70.7	72.1	69.7	2.4
	With access to formal credit	22.4	23.6	21.5	2.1
	With food insecurity level (high)	8.5	7.2	9.5	-2.3
	Per capita monthly income (USD)	31.9	33.2	30.9	2.3
Dwelling	Household size	5.7	5.6	5.7	-0.1
	Number of people per room	2.9	3.2	2.8	0.4***
	Percentage dwelling with dirt floor	28.2	31.8	25.4	6.4*
	Percentage owning own house	59.0	68.5	52.8	16.7***
Assets	Mobile phone	72.4	77.8	68.5	9.2**
	Washing machine	27.6	27.5	27.6	0.1
	Sound player	31.0	36.7	26.7	10.1***
Observations		714	346	368	714

Note: Robust standard errors, clustered by session. Significance: * at 10%; ** at 5%; *** at 1%.

as well as more knowledge about different existing government programs. If our treatment group have been living in the zone for longer, the results could indeed be explained by selection on unobservables. In fact, it is the opposite, which leads us to argue that the empirical findings are likely to constitute a lower bound on the program effect.

4.3 Network data

Conducting lab in the field experiments in large cities presents challenges in terms of costs, time, recruitment and attendance (Candelo and Polanía-Reyes, 2008; Ñopo et al., 2008). Since the sessions were scheduled on short notice (less than a week), we gave the beneficiaries as much freedom to choose the session that suited them. 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 at the session in groups.[15] In all zones, participants self-selected into sessions by responding to an invitation; after that, they were assigned into groups using the density measure from Section 3.

Table 2 presents the average number of friends, acquaintances, and connections (the sum of relatives, friends and acquaintances) that each participant reports in the session[16]. We also report features of the in-session network such as the friendship, acquaintanceship, and connectivity densities. 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 more player in the session. We find no statistical differences in terms of connectivity across levels of exposure.

Observations within our control group (beneficiaries with less than a year in the CCT) and our treatment group (beneficiaries with more than a year in the CCT) could be correlated because they share common characteristics besides the assignment into treatment and control. However, the intra-class correlation coefficient within exposure groups is relatively low at 0.18. Individuals within groups are no more similar than individuals between groups, and we effectively assigned 714 individuals to treatment or control. We can reject that we have only two independent observations.

[15]For example, implementing sessions with 25 randomly allocated individuals was impractical and infeasible. The experimental session sites were 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 zone. For example, during the first four days we conducted the experiments with participants in Pozón and the following four days with participants from other zones. The fact that individuals are not randomly allocated into sessions allowed us to obtain enough variation in terms of the density and quality of the network across sessions.

[16]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.

Table 2: Network characteristics at the session level

Exogenous Variable	All	Exposure		Difference
		Long	Short	
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 identified leaders	0.18	0.20	0.16	0.04
Connectivity score[c]	5.38	5.45	5.32	0.13

Note: 714 observations. 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. [c] Score used in Equation(2) to allocate individuals to group A, B or C. Robust standard errors of the difference clustered by session. *Significant at 10%; **significant at 5%; ***significant at 1%.

5 CCT exposure and efficient coordination

5.1 Identifying coordination, networks and cooperation

This section analyzes individual behavior in the games and explores confounds that may affect the interpretation of the relationship between the ability to coordinate efficiently and the exposure to the program. Table 3 reports the measures collected from the ME game and presents the results separately by length of exposure (short or long) to the program. 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.

CCT exposure improves the ability to coordinate efficiently. In all relevant variables that indicate the ability to coordinate on the efficient outcome, players with long exposure coordinate significantly better with 28.3% more participants choosing the highest level of effort and 25.1% more groups actually achieving the Pareto-efficient equilibrium. The percentage of individuals choosing the safe option was 25.7% higher among those with short exposure and 35% more short-exposure groups achieved the risk-dominant equilibrium.

CCT exposure improve earnings from high effort. Earnings are $1.04 higher for those who both choose the high level of effort and are longer exposure beneficiaries. Figure 1 shows average earnings for each level of effort and enrollment exposure. Short exposure beneficiaries that chose high level of effort had significantly lower earnings than anyone else. This result reflects the coordination failure: it is not enough to know what is the best individual choice for the group if others choose a different option.

Neither effort nor efficient coordination improve with network density. For each level of network density (i.e. High, Medium or Low), long exposure participants show significantly higher levels of effort, with a difference of 0.34, 0.60 and 0.68 respectively. Long exposure players also show significantly higher ME levels, with a difference of 0.64, 0.44 and 0.66, respectively. However, we reject our hypothesis that groups with high density coordinate more efficiently within levels of exposure. Figure 2 shows individual effort and ME by levels of density. There are no significant differences within short and long exposure participants. High density groups exert similar effort to other groups.

CCT exposure does not improve cooperation. Table 4 reports behavior differences across levels of exposure in the public goods game and experimental characteristics at the session level. In spite of the low MPC and urban scenario, we observe deviations from the Nash equilibrium with 29.3% and 27.3% participants contributing in the first and second round respectively. There is a weakly significant difference in contribution in the first round, with long exposure participants contributing *less*.[17]

5.2 Effect of CCT exposure on efficient coordination

The evidence in this section examines the initial findings described in Table 3 in a multivariate setting. We use an ordinal choice model to test the hypothesis

[17] The percentage of participants who had a perfect understanding of the public goods game was significantly higher in the short-exposure sample, but this is not relevant to our setting because participants did largely understand the weak link game, both in the long and short exposure samples. Attanasio et al. (2015) examine these intriguing effects by 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 on first-round cooperation but this effect is found only in recently enrolled beneficiaries and fades with time.

Table 3: Behavior in the coordination game

Outcome Variable	**All**	**Exposure**		**Difference**
		Long	**Short**	
Average effort decision (1, 2 or 3)	2.34 (0.11)	2.65 (0.12)	2.11 (0.13)	0.54*** (0.17)
Percent of players that chose 1	24.2 (5.1)	9.5 (3.9)	35.2 (7.1)	-25.7*** (7.9)
Percent of players that chose 2	17.2 (2.7)	15.7 (5.1)	18.3 (2.7)	-2.6 (5.6)
Percent of players that chose 3	58.5 (5.8)	74.8 (8.3)	46.5 (6.2)	28.3*** (1.0)
Average ME in the group (1, 2 or 3)	1.54 (0.13)	1.88 (0.21)	1.28 (0.10)	0.61*** (0.21)
Percent of groups with a ME of 1	63.6 (7.3)	43.3 (10.4)	78.7 (7.3)	-35.4*** (1.2)
Percent of groups with a ME of 2	19.3 (4.8)	25.2 (7.3)	14.9 (5.8)	10.3 (8.9)
Percent of groups with a ME of 3	17.1 (6.2)	31.5 (11.6)	6.4 (3.0)	25.1** (11.1)
Average earnings from choosing 3[a]	1.42 (0.28)	1.89 (0.37)	.86 (0.26)	1.04** (0.41)
Player understood best outcome[b]	65.8 (1.8)	70.2 (2.9)	62.6 (2.0)	7.6** (3.4)
Average effort decision in Group H[c]	2.38 (0.11)	2.58 (0.16)	2.24 (0.14)	0.34* (0.20)
Average effort decision in Group M	2.29 (0.12)	2.63 (0.14)	2.03 (0.16)	0.60*** (0.21)
Average effort decision in Group L	2.36 (0.12)	2.75 (0.10)	2.07 (0.15)	0.68*** (0.17)
Average ME in Group H	1.59 (0.15)	1.96 (0.24)	1.32 (0.14)	0.64** (0.26)
Average ME in Group M	1.47 (0.14)	1.77 (0.26)	1.24 (0.11)	0.44** (0.26)
Average ME in Group L	1.55 (0.15)	1.93 (0.22)	1.27 (0.14)	0.66*** (0.24)
Size group M[d]	8.7 (0.1)	8.8 (0.1)	8.6 (0.2)	0.2 (0.2)
Number of groups	87	42	45	87

Note: [a] Earnings in US dollars. [b] The best outcome is everyone choosing 3. [c] Individuals with the highest connectivity score were allocated to Group H. Individuals with the lowest connectivity score were allocated to Group L. Remaining participants were allocated to Group M. [d] If the session was smaller or larger than 24 participants, we kept groups H and L sizes constant (8 people) and let the size of group M variable. We account for these differences in the regression analysis. Robust Standard errors, clustered at the session level, in parenthesis. * Significant at 10%; **significant at 5%; ***significant at 1%.

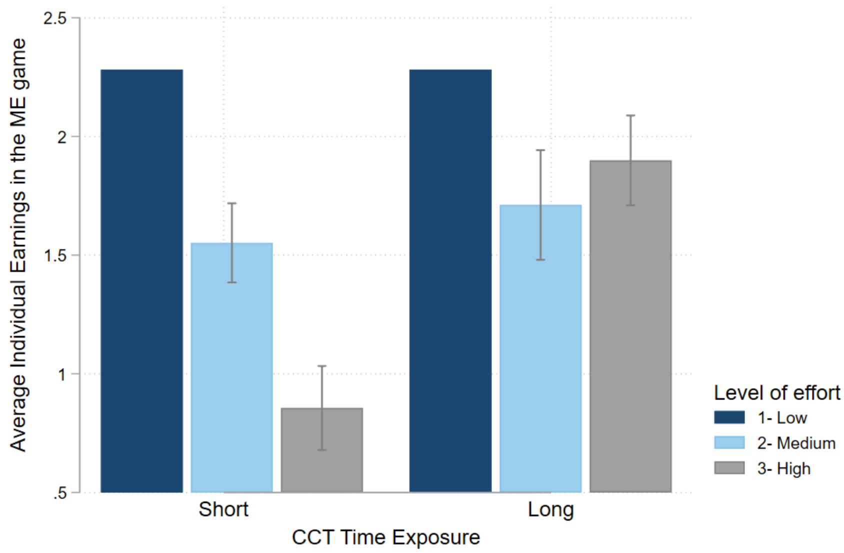


Figure 1: CCT Exposure and individual earnings by effort. The whiskers depict the 95% confidence intervals. A non-parametric analysis confirms a statistically significant difference of High effort levels between short and long CCT exposure. (Mann-Whitney test, $p = 0.00$).

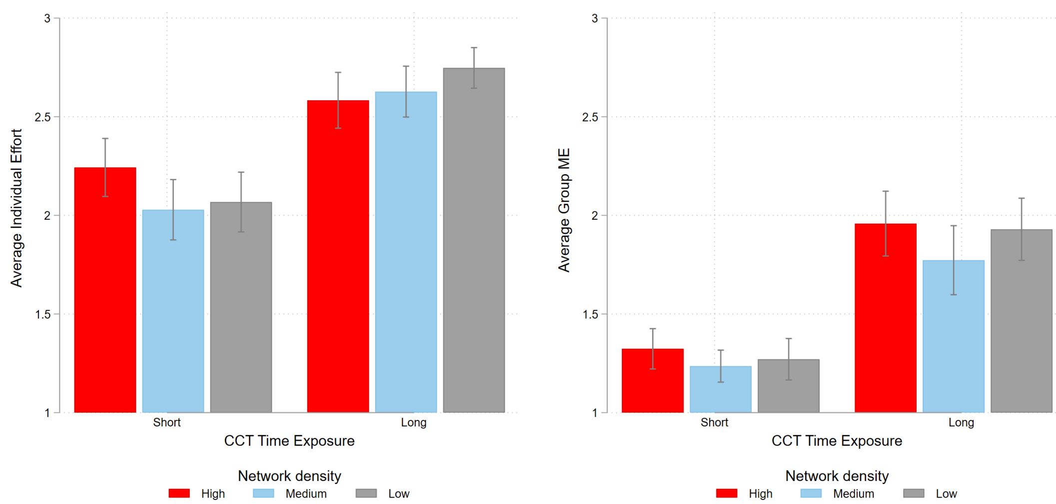


Figure 2: Individual effort and Group minimum effort by network density and CCT Exposure. The whiskers depict the 95% confidence intervals. A non-parametric analysis confirms that the difference between short and long exposure groups is statistically significant (Mann-Whitney test, $p = 0.00$).

Table 4: Behavior in the public goods game

Level Variable	All	Long Exposure	Short Exposure	Difference
Average % contributors - round 1	29.3 (3.7)	22.3 (4.2)	34.5 (5.2)	-12.2* (6.5)
% sessions with no contribution - round 1	10.5 (5.8)	14.8 (1.0)	7.3 (6.1)	7.4 (10.8)
Average % of contributors - round 2	27.3 (4.4)	25.6 (7.2)	28.6 (5.1)	-3.0 (8.4)
% sessions with no contribution - round 2	14.0 (6.6)	23.0 (12.0)	7.3 (6.1)	15.6 (12.7)
Player understood VCM best outcome[a]	19.7 (2.0)	12.8 (3.1)	24.9 (2.1)	-12.2*** (3.8)
Session size	24.6 (0.1)	24.7 (0.2)	24.6 (0.2)	0.2 (0.3)
Number of sessions	29	14	15	29

Note: [a] The best outcome for the group is everyone contributing to the group account. Robust Standard errors are clustered at the session level in parenthesis. * Significant at 10%; ** significant at 5%; *** significant at 1%

that exposure is relevant for the high effort outcome. The unit of observation is individual i of group g in session s. We estimate a 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^*. The continuous latent variable

$$Y_i^* = \alpha + \beta X_i + \delta N_{igs} + \lambda G_{gs} + \theta S_s + \nu_s + \varepsilon_{igs}$$

has a disturbance term ε_{igs} $i.i.d. \sim N(0,1)$ that is independent from ν_s $iid \sim N(0, \sigma_\nu^2)$. N_{ig} includes number of friends, relatives and acquaintances in the group. G_{gs} includes session size, a dummy for the first session of the day, an experimenter fixed effect, a dummy for presence of a man in the group, the average group effort from the previous two sessions and an indicator for the presence of a ML in the group. The probability distribution for Y_i is given by

$$P(Y_i > j) = \frac{\exp(\alpha_j + X_{1i}\beta_1 + X_{2i}\beta_{2j})}{1 + \exp(\alpha_j + X_{1i}\beta_1 + X_{2i}\beta_{2j})}\ j \in \{1, 2\}, \tag{3}$$

where X_{ki} are individual observable characteristics (including our variable of interest, i.e. a dummy for being enrolled in the program for longer than a year). β_1 are the parameters that are constrained to be the same among levels of effort and β_{2j} are those that are set free to differ. Treatment varies at the session level and subjects interact within the experimental session, so standard errors are not independent. We cluster them at the session level in all our specifications.

The three possible equilibria are ordered from the least to the most efficient equilibrium, so that the effort decision is an ordinal outcome. We start by applying Brant's test of parallel-regression/parallel-lines/proportional-odds assumption (see Fu (1998); Long and Freese (2006)). It is equivalent to a series of binary logistic regressions where categories of the dependent variable are combined, pareto-dominant, $e = 1$ is contrasted with $e \in \{2, 3\}$, and for $e = 2$ the contrast is with $e \in \{1, 3\}$.

We confirm the assumption of parallel regressions is not met (we have a significant overall chi-square value):[18] one or more coefficients differ across values of j. However, if the assumption is violated only by one or a few of our independent variables, it is not necessary to relax the parallel-lines constraint for all variables, in particular for the exposure to the program. We choose a partial proportional odds model, where the parallel-lines constraint is relaxed only for those variables where it doesn't significantly hold.[19]

Table 5 presents the marginal effects for a partial proportional odds model for the decision to exert the low and high individual levels of effort. The dependent variable is the individual probability of choosing a low effort level (high effort level). Specification (1) shows the marginal effect of exposure to the program alone. The marginal effect is 32% to the likelihood of choosing the high level of effort. In contrast, the probability of choosing the lower level of

[18]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.

[19]We use a Wald test 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).

effort by participants enrolled in the program longer than a year is 23% lower. The negative coefficient for exposure means that the likelihood of coordinating on the least efficient equilibrium decreases when enrollment into the program is longer than a year.

Specifications (3) to (5) present the marginal effects for a partial proportional odds model for the decision to exert the low and high individual levels of effort when controlling for socioeconomic variables at household and individual level, experimental variables and participant's variables related to the program. Specifications (2) and (5) show the marginal effect of exposure to the program and dummies equal to one if the participant contributed to the public project in the first round.[20]

Individuals who cooperated in the first round also present a higher probability (+12%) of choosing high level of effort and a lower probability of choosing the lowest level of effort (-8%). Adding controls at the household, experimental and CCT level, cooperation loses statistic significance. While holding all other independent variables constant at their means, those players with an exposure of more than a year and having friends were 45% 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 30% and 3% less likely to choose the lowest effort level, respectively.

In a coordination setting, a leader may have a strong influence on the equilibrium selection (Bala and Goyal, 1998; Eckel and Wilson, 2000, 2007). Contrary to evidence from previous coordination games in the lab (Foss, 2001; Gillet et al., 2011; Brandts et al., 2015), in specification (5) we don't find a relation between being a ML, an informal leader, or the presence of a ML in the group, and the effort decision. This study 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).

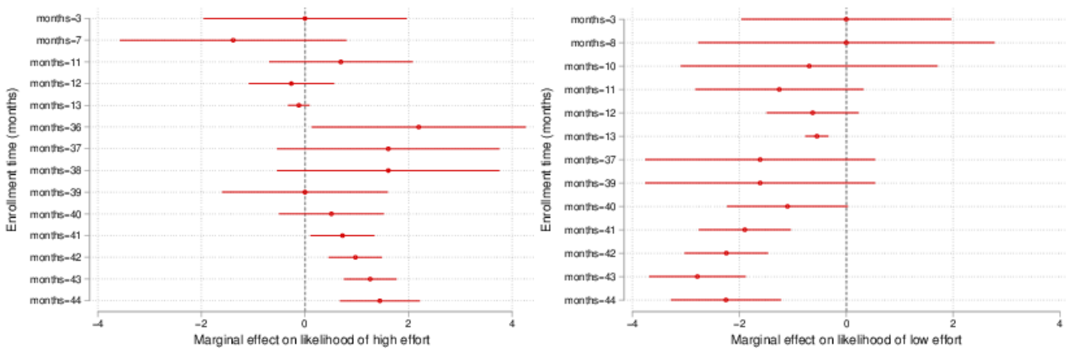
[20] Only behavior in the first round is included, as it is a one-shot of willingness to cooperate while behavior in the second round is related to the effect of cheap talk and other unobserved variables. The results are robust when including cooperative behavior in the second round.

Table 5: Marginal effects of a partial proportional odds model for the lowest and highest individual level of effort (N=714).

Specification	(1)		(2)		(3)		(4)		(5)	
Dependent Variable: Level of effort	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**
Beneficiary longer than a year (enrollment)	-0.23***	0.32***	-0.24***	0.34***	-0.19***	0.27***	-0.29***	0.43***	-0.30***	0.45***
	(0.09)	(0.11)	(0.09)	(0.12)	(0.08)	(0.11)	(0.08)	(0.10)	(0.07)	(0.10)
Cooperation decision round 1			-0.08*	0.12*					-0.06	0.09
			(0.05)	(0.07)					(0.04)	(0.06)
Degree of Player (friends)			-0.03*	0.05**					-0.03*	0.05**
			(0.02)	(0.02)					(0.02)	(0.03)
Degree of Player (relatives)			0.04	-0.06					0.03	-0.05
			(0.04)	(0.05)					(0.04)	(0.05)
Degree of Player (acquaintances)			-0.01	0.02					0.00	0.00
			(0.03)	(0.04)					(0.03)	(0.04)
Basic characteristics	No		No		Yes		Yes		Yes	
Experimental variables	No		No		No		Yes		Yes	
Leadership variables	No		No		No		No		Yes	

Note: Robust Standard errors are clustered at the session level in parenthesis. * Significant at 10%; ** significant at 5%; *** significant at 1%. When adding controls, 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. The included individual characteristics are gender, age, level of education, number of years living in the zone; whether the player is displaced, is the head of the household, has a partner or is beneficiary of another program different from FA; housing conditions such as the number of people per room, whether the housing is owned, whether the housing has electricity, water pipe access and sewage. Finally it reports wealth measured as assets (such as landlines, cellphone, sound-player and DVD player), household income and perception of wealth with respect to other households in the zone. Experimental 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 size of the session. Leadership variables are if there is a ML in the group, if player is a ML, if the player was selected as informal leader by others in the group. Tables 7 and 8 present the corresponding coefficients.

The findings so far have been based on a binary comparison between the long exposure and the short exposure samples, which is driven by the time increments involved in the program implementation and the timeline of the experiment. However, we are able to measure time exposure in months. To show further evidence about the incremental impact of exposure time, we now estimate the logit model with fixed effects for month of exposure. The results, shown in Figure 3, show that the effect is monotonically varying, which confirms that the time exposure is not proxying for another attribute that differs across the long and short exposure samples.



A. Probability of exerting high effort B. Probability of exerting low effort

Figure 3: Marginal probability of choice by month of exposure. The two plots above report the marginal effect of the number of months in the program on a logit specification for the probability of choosing high and low effort on number of months in the program. We use the combined sample (714 obs) for this estimation.

Despite the fact that there is no univocal indication of the long exposure sample being wealthier than the short exposure one, one possible concern about the results presented so far is reverse causality. According to this alternative explanation, long exposure participants have received the CCT for longer time and thus have accumulated more wealth than their short exposure counterparts. In Table 7, most wealth proxyes are statistically insignificant, with the exception of the indicator variable for the existence of a landline, which has a negative coefficient. Because the coefficient is of opposite sign to that of our main variable of interest, we argue that were reverse causality issues at play, they would be likely biasing our estimates towards zero.

6 Pinning down expectations: level-k and QRE

6.1 Level-k

The empirical results suggest that connections formed by the program foster efficient coordination whereas preexisting connections fail to do so. To reconcile these seemingly contradictory findings, we posit that program beneficiaries have a level of interaction where they can give each other the "benefit of error". To gauge this benefit of error, we elicit expectations from a level-k model. Then we move to a quantal equilibrium setting to explain the puzzle of induced interaction relative to prior connections.

Harsanyi and Selten (1988) present payoff dominance as based on collective rather than on individual rationality. In this section we make an explicit connection between expectations and best response, which will in turn allow us to infer expectations from observed outcomes. We start with a nonequilibrium setting, namely a level-k model. The first step in calculating best reply functions is to compute the distribution for the minimum statistic of the 7 random variables $X_2, \ldots, X_8$, where each $X_j \in \{1, 2, 3\}$. We do so in section 7.

For a given $t \in \{1, 2, 3\}$, the probability distribution $P(X \leq t)$ is a vector (p_1, p_2, p_3), where p_3 is the probability that the L0 player will exert the highest effort, and p_1 the probability that he will exert the lowest effort. As shown in appendix 7, P induces a distribution P_{min} over the minimum effort of all $N-1$ opponents. The expected payoff from choosing $e_i \in \{1, 2, 3\}$ is thus given by

$$E[\pi(e_i, P)] = 3 \sum_{k=1}^{3} P_{min}(k) \left(1 + \min(k, e_i) - \frac{2}{3} e_i\right) \tag{4}$$

As an example, we show in appendix 7 that the best reply function is always the lowest effort when L0 randomizes uniformly, i.e., $p_1 = p_3 = 1/3$. This would fail to capture the behavior we observe so, in what follows, we consider probabilities that differ from the uniform distribution.

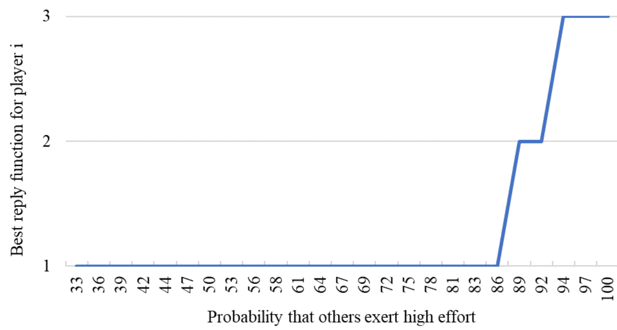


Figure 4: Best reply function by player i. Best reply function of L1 types when playing against an L0 type with distribution $((1-p_3)/2,(1-p_3)/2,p_3)$. The best reply is plotted against the probability p_3 of high effort.

To parametrize the probability distribution in a parsimonious way, we assume that the L0 probability is given by $((1-p_3)/2,(1-p_3)/2,p_3)$. Thus, L0 players anchor on a given probability of exerting high effort, and randomize uniformly over the other two outcomes. As we vary p_3, the best reply function is given by Figure 4. The function features a unique best reply at the lowest effort for all $p_3 \leq 0.88$. At that point L1 is indifferent between choosing 1 and 2 (higher types will then choose 1). For $p_3 \in [0.88, 0.95]$, the best reply function is 2 (in which case, higher types choose 2). After p_3 crosses the indifference point of 0.95 between 2 and 3, the best reply becomes 3 (and higher types choose 3).

The previous characterization of the best reply function shows two things. First, the best reply function can take any value, depending on L1 expectations, so the model can capture observed behavior. Moreover, because higher types choose the same level of effort as L1, we don't have to worry about the entire cognitive hierarchy (Camerer et al., 2004), and instead use observed behavior to pin down L1 expectations. However, the highest effort is only a best reply when L1 players are near certain (more precisely, with over 94.38% probability) that L0 players are anchored on high effort.

6.2 Quantal response equilibrium

Imposing an equilibrium condition on expectations sheds additional light on the fragility of the payoff dominant equilibrium. We now estimate a quantal response equilibrium (QRE) model (McKelvey and Palfrey, 1995, 1998). Players' expectations about the possibility of errors by other players determines an equilibrium, which captures the fragility of the efficient outcome due to strategic uncertainty. This equilibrium analysis provides a limiting point of a learning process in which expectations, as described above, evolve with observed distributions of others' decisions (Goeree et al., 2016, Chapter 4).

Players' moves are independent, with i.i.d. error structures. The QRE condition relates the probability of playing a given strategy to the relative advantage of the expected payoff. When players' expected payoff is given by (4), the logit equilibrium is characterized by matching expectations and probability of playing a given action as follows:

$$P(e_i = j) = \frac{\exp(\lambda E[\pi(j, P)])}{\sum_{k=1}^{3} \exp(\lambda E[\pi(k, P)])} \tag{5}$$

In equation (5), the parameter $\lambda \geq 0$ captures the degree of payoff-maximizing behavior: a higher value means less noise, whereas $\lambda = 0$ implies random behavior. Unlike level-k, all players have the same expectations (and there is common knowledge about it). Solving equation (5) for each value of λ,[21] we find a correspondence with two branches. Out of the equilibrium triplet, we plot in Figure 5 the probability of choosing high effort along the two branches of the QRE correspondence. An upper branch, featuring high effort, arises for values of λ between 0.4 and 7.3. Otherwise, we observe a unique QRE that tends toward the dominant outcome as $\lambda \to \infty$.

Whereas the results from the level-k estimates show the expectation interval supporting an outcome of high effort, the QRE results show that such outcome only holds for a restricted set of values of λ. Nevertheless, it is within that interval that we find the closest fit to our observed frequency for

[21] We solve it as a minimum squared error problem, see appendix 7.

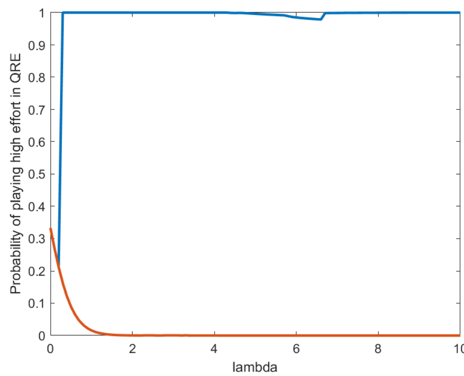
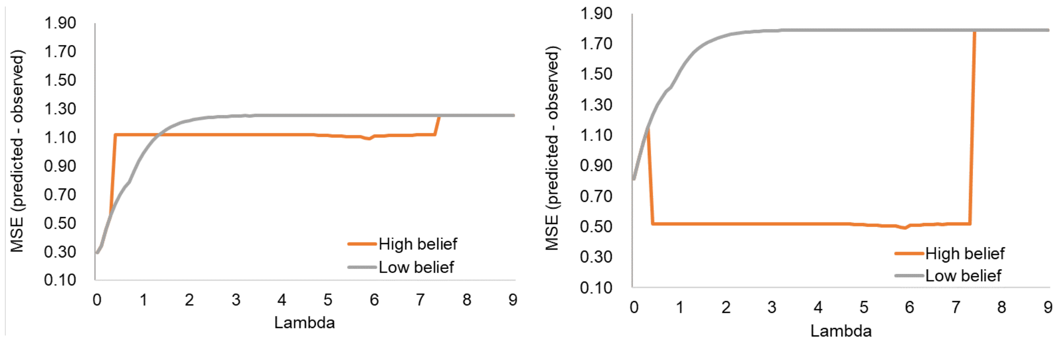


Figure 5: Quantal response equilibrium correspondence. QRE resulting from our game specification. For each value of λ, we find the two possible solutions to equation (16).

the participants that were exposed to the program. In Figure 6, we show the mean squared error (MSE) that arises between the predicted (QRE) distribution and the observed frequency, for each subset of the sample. The MSE is minimized along the QRE branch corresponding to high effort (for $\lambda = 5.9$, more precisely). This stands in contrast to the control sample, where the MSE minimizer is achieved at random behavior (i.e. at $\lambda = 0$).[22]

Note that the upper branch in the QRE correspondence is made possible by the number of players in the game. As noted by Van Huyck et al. (1990), having a large number of players worsens strategic uncertainty, which in the limit creates a trap of risk dominance. We show that our game follows the same pattern. Keeping the payoff function constant, we derive the QRE correspondence that follows as the number of players rises. As shown in Figure 8 in the appendix, the upper branch shrinks (and eventually disappears) as the number of players grows. Still, our result highlights the scope for an

[22]The empirical estimate of the rationality parameter λ relies on our assumption of i.i.d. errors, which we find plausible given the experimental setup. Haile et al. (2008) show that, with a more general error structure, any distribution of behavior can be rationalized. While this observation places a note of caution on the empirical content of the QRE, it does not have implications about the shape of the equilibrium correspondence, which is our most important takeaway in our setting.



A. Control sample

A. Treated sample

Figure 6: Quantal response equilibrium - minimum squared error. For each value of payoff responsiveness λ we compute the mean squared error between the distribution we observe (for both controls and treated groups) relative to the QRE distribution.

equilibrium selection mechanism through being exposed to the CCT program.

7 Conclusion

Can a government intervention foster collective action? We measure the impact of a CCT on beneficiaries' ability to reach the Pareto optimal outcome in a pure coordination game. We argue that the intervention has effectively created a communication precedent that works as a coordination device. There is a positive and significant relation between the individual effort decision and beneficiary exposure to the program. This relation is robust to controlling for potential confounds such as willingness to cooperate, individuals' connections within the session and individual socio-economic characteristics. Additional time in the program increase (decrease) the likelihood of choosing high (low) effort.

The coordination mechanism operates through expectations. Using a level-k model we show that for a player best responding to random behavior, the random behavior being responded to must have a distribution that is strongly skewed towards high effort (95% of probability or more). Quantal response analysis shows that this depends on the payoff responsiveness of players. While for very low (or very high) levels of payoff responsiveness, only the risk dominant strategy holds in equilibrium, there is a range where the high effort equilibrium can be sustained. In summary, the results suggest that the government intervention foster a precedent to empirical expectations.

Our structural findings on expectations show both the plausibility and the fragility of such a coordination device, shedding light on the a priori contradictory finding that network links created by the CCT matter for efficient coordination, but those predating the CCT do not. This suggests a word of caution towards using a government intervention to improve efficiency of collective action: while the short term effect may bring about relationships where the benefit of doubt exists, the outcome is still fragile to strategic uncertainty and risk dominance.

Our research is a step towards understanding what system of expectations supports and defines effective collective action. We uncover an unintended benefit of a policy instrument, which will hopefully give rise to more such studies that guide intervention design to feature a social component, seeking mechanisms to solve coordination failures within communities. This intervention is special in terms of requirements of meetings relative to other cash transfer programs. In that case, our findings only generalize to other social protection programs that have a similarly behavioral scope. In particular, they can inform new phases of government interventions that target collective action among beneficiaries (Gallego and Polanía-Reyes, 2021).

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Appendix

1. Level-k approach to the Minimum Effort game

As an experimental design, consider an adaptation of Van Huyck et al. (1990) with 8 players and 3 choices. Players simultaneously determine their level of effort in order to maximize their expected payoff in the game, determined by the minimum level of effort in the group minus the cost of effort each player incurs

$$\pi_i^{ME} = \pi(x_i, x_{-i}) = 3 + 3\min(x_1, \dots, x_n) - 2x_i \tag{6}$$

where $i = \{1, 2, ...8\}$ and x_{-i} are other players' levels of effort.
In level-k modelling, the default assumption is that L0 choices have a uniform random distribution over available pure strategies; the relative frequency of L0 types is often, but not always, assumed to be zero (Crawford et al., 2013). In an 8-player game, an L1 player chooses the strategy with the highest mean payoff to herself (against L0 players with a given pobability), which might be interpreted as a plausible representation of strategic naïveté.
L1 best responds to the distribution of others' minimum effort, the distribution of which we now derive. Let be the level of effort $X_i \in \{1, 2, 3\}$ for each player $i \in \{1, ...8\}$. From the perspective of player 1, the probability distribution of the minimum over the other 7 players' effort is derived as follows:
For every value of $t \in \{1, 2, 3\}$:

$$P_{min}(t) = P\left(\min_{j\in\{2,..8\}} X_j \leq t\right) \tag{7}$$

$$\begin{aligned} P\left(\min_{j\in\{2,..8\}} X_j \leq t\right) &= 1 - P\left(\min_{j\in\{2,..8\}} X_j > t\right) && (8)\\ &= 1 - P(X_2 > t, \dots, X_8 > t) && (9)\\ &= 1 - \prod_{j=2}^{8} P(X_j > t) && (10)\\ &= 1 - \prod_{j=2}^{8}[1 - P(X_j \leq t)] && (11)\\ &= 1 - [1 - P(X \leq t)]^7 && (12) \end{aligned}$$

As an example, assume first that the L1 player best responds against the uniform distribution (L0), which is given by $P(X \leq t) = t/3$. Then the probability that the level of effort t be the minimum effort by the other players is

$$P_t = P\left(\min_{j\in\{2,..8\}} X_j \leq t\right) \tag{13}$$

$$= 1 - (1 - t/3)^7 \text{ for } t \in \{1,2,3\} \tag{14}$$

We now compute the best reply function. The expected payoff for player 1 is given by

$$E(\pi(x_1,t)) = \sum_{t=1}^{3} \pi(x_1,t)p_t \tag{15}$$

where p_t denotes the probability density associated to the distribution P_t from (14).
By inspection, we find that the objective function (15) is maximized at $t = 1$, i.e., the uniform-L1 player always chooses the risk dominant action. Note that higher types $k > 1$ also choose $t = 1$ in this case. For the specification $((1 - p_3)/2, (1 - p_3)/2, p_3)$ introduced in section 6, the best reply function is given by Figure 4.

2. Quantal response equilibrium

The QRE can be computed solving

$$\min_{p\in[0,1]^3} \sum_{j=1}^{3} \left(p(j) - \frac{\exp(\lambda E[\pi(j,P)])}{\sum_{k=1}^{3} \exp(\lambda E[\pi(k,P)])}\right)^2. \tag{16}$$

The minimum is attained at the solution of equation (5). We look for possible solutions of equation 16 using Matlab's optimization package (using the fmincon function). Each branche of the equilibrium correspondence shown in Figure 5 (and remaining figures) is found using $(0.05, 0.05, 0.9)$ and $(0.9, 0.05, 0.05)$ as initial guesses to the solver.

3. Additional Tables and Figures

4. Experimental Instructions

The sentences in italic are not read in public; they are instructions for a supervisor and coordinators. The supervisor introduces the team, the session and reads the consent form in order to obtain oral consent.

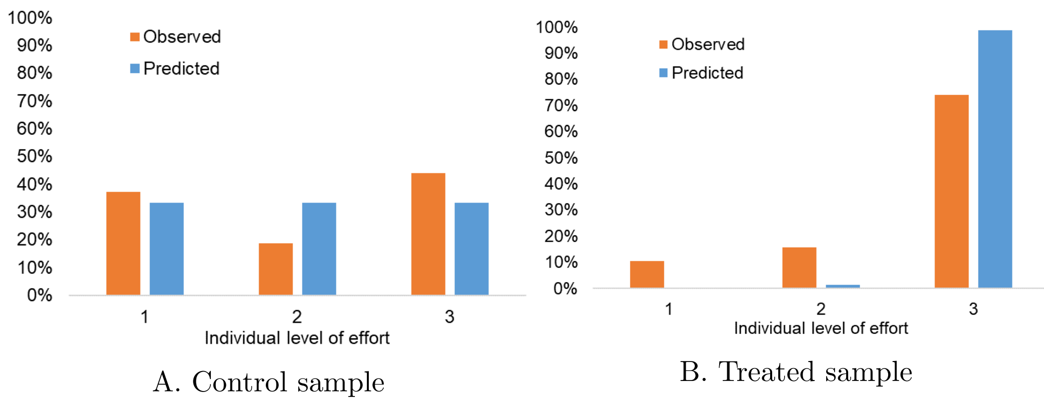

Figure 7: Quantal response equilibrium - observed and predicted.We compare the observed frequency of responses to the probability distribution generated by the QRE that fits the data most closely.

Table 6: Coordination game. Payoffs table

Player's	Minimum effort by other players		
Effort	1	2	3
1	\$4	\$4	\$4
2	\$2	\$5	\$5
3	\$0	\$3	\$6

Note: Values in COP thousands. Official exchange rate: US\$10=COP\$17,530 (monthly mean average for July 2008, `http://www.oanda.com`)

Exercise 1: The Public Goods Game (Attanasio et al., 2009, 2015)

You are going to take part in the first exercise that consists of two decision rounds. Now, we will describe in detail the process that will be repeated in all two decision rounds.

Now let's start the second round. Before the second round of this exercise, you will have an opportunity to communicate for 10 minutes with one or more participants in this room about this exercise. This communication is totally voluntary. After the 10-minute permitted time is over, all communications will be suspended. And we will proceed to the second round of this exercise. Coordinators will hand out two cards (a MY TOKEN card and a BLANK card) for each participant. Just as in the first round, you will just need to decide which card (either MY TOKEN card or BLANK card) you want to put in the bag. Again all decisions in this round will be private and be kept strictly confidential.

Past the 10 minutes, once all the participants have finished playing the second round, two coordinators should count how many blank cards and how

Table 7: Control variables in Table 5. Marginal effects of a partial proportional odds model for the lowest and highest level of effort - Basic Characteristics.

Specification	(3)		(4)		(5)	
Dependent Variable: Level of effort	**Low**	**High**	**Low**	**High**	**Low**	**High**
1 if the player is a woman	-0.15	0.22	-0.07	0.1	-0.04	0.6
	(0.15)	(0.21)	(0.1)	(0.15)	(0.11)	(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	-0.02	0.02*	-0.02*	0.02	-0.03
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
Number of years living in the zone	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	-0.02	0.02	-0.02	0.01	-0.02
	(0.05)	(0.07)	(0.05)	(0.07)	(0.05)	(0.08)
1 if the player is the head of household	0.00	0.00	0.02	-0.03	0.01	-0.02
	(0.03)	(0.04)	(0.03)	(0.04)	(0.03)	(0.05)
1 if the player has a partner	-0.03	0.05	-0.02	0.02	-0.02	0.03
	(0.04)	(0.05)	(0.04)	(0.06)	(0.04)	(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	0.03	-0.01	0.02
	(0.03)	(0.04)	(0.02)	(0.04)	(0.03)	(0.04)
1 if the player's home has no electricity	-0.01	0.01	0.02	-0.02	0.03	-0.04
	(0.07)	(0.1)	(0.07)	(0.11)	(0.06)	(0.09)
1 if the player has a landline	0.06**	-0.09**	0.07**	-0.11**	0.07**	-0.11**
	(0.03)	(0.04)	(0.03)	(0.05)	(0.03)	(0.05)
1 if the player has a cellphone	-0.01	0.01	0.01	-0.02	0.00	-0.01
	(0.03)	(0.04)	(0.03)	(0.05)	(0.03)	(0.05)
1 if the player's home has water pipe access	-0.07**	0.11**	-0.05	0.08	-0.06	0.09
	(0.04)	(0.05)	(0.03)	(0.05)	(0.04)	(0.06)
1 if the player's home has sewage	0.02	-0.03	-0.01	0.01	-0.01	0.02
	(0.03)	(0.04)	(0.03)	(0.05)	(0.03)	(0.05)
1 if receiving any other government aid	-0.02	0.03	-0.04	0.06	-0.03	0.04
	(0.02)	(0.03)	(0.03)	(0.04)	(0.03)	(0.04)
1 if perceiving HH income is the highest	-0.33***	0.1	-0.25***	0.01	-0.06	0.09
	(0.1)	(0.12)	(0.07)	(0.1)	(0.07)	(0.1)
1 if Perceiving HH income is above average	-0.04	0.06	-0.01	0.02	-0.01	0.02
	(0.06)	(0.08)	(0.05)	(0.08)	(0.05)	(0.08)
1 if the HH has a sound player	0.00	0.00	-0.01	0.01	0.00	0.00
	(0.03)	(0.04)	(0.03)	(0.04)	(0.03)	(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	-0.01	0.01	-0.01	0.01	-0.01
	(0.03)	(0.05)	(0.03)	(0.04)	(0.03)	(0.04)
Basic characteristics	Yes		Yes		Yes	
Experimental variables	No		Yes		Yes	
Leadership variables	No		No		Yes	

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

Table 8: Control variables in Table 5. Marginal effects of a partial proportional odds model for the lowest and highest level of effort -Experimental variables and CCT measures

Specification	(4)		(5)	
Dependent Variable: Level of effort	**Low**	**High**	**Low**	**High**
1 if there is at least one man in the group	0.09	-0.14	0.12	-0.18
	(0.09)	(0.13)	(0.09)	(0.14)
1 if the player understood the activity perfectly	-0.02	0.02	-0.02	0.02
	(0.02)	(0.04)	(0.03)	(0.04)
1 if Experimenter No2 (female) in 2008	-0.18**	0.26**	-0.17**	0.26**
	(0.09)	(0.13)	(0.09)	(0.13)
Number of players in session	0.09**	-0.13***	0.08**	-0.13***
	(0.04)	(0.05)	(0.04)	(0.05)
1 if First session in the day	-0.03	0.05	-0.02	0.03
	(0.08)	(0.13)	(0.08)	(0.12)
Average level of effort in the last two sessions [a]	-0.1	0.14	-0.11	0.16
	(0.11)	(0.16)	(0.11)	(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)
Basic characteristics	Yes		Yes	
Experimental variables	Yes		Yes	
Leadership variables	No		Yes	

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

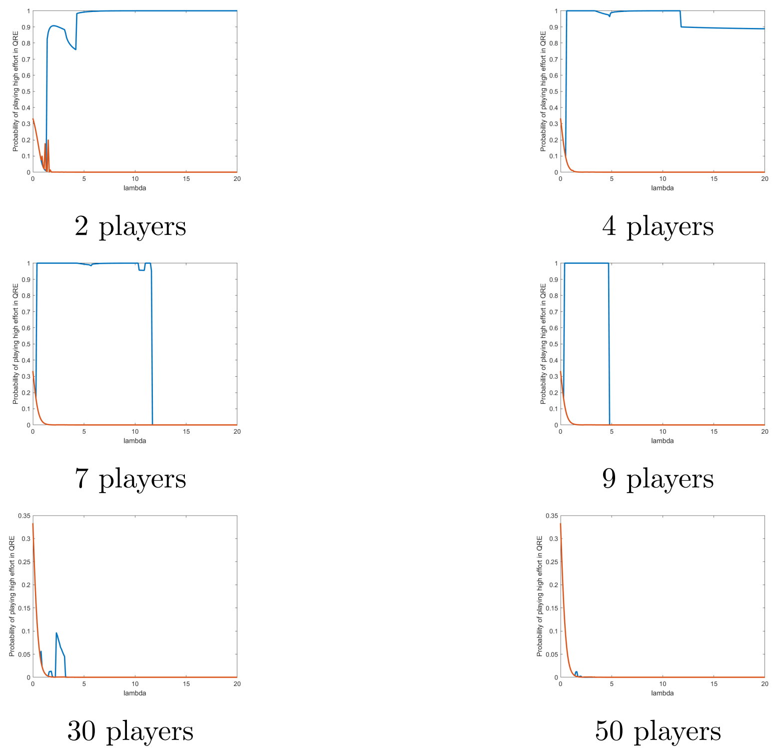

Figure 8: Quantal response equilibrium - effect of the number of players
Using the same payoff matrix from our minimum effort game, we modify the number of players in equation (14), update the distribution of the minimum statistic and derive the new equilibrium correspondence.

many "MY TOKEN" cards there are in the bag. These two coordinators should fill the MONITORS CALCULATION SHEET and finish processing the PAYMENT SHEET. Please keep this second round card safe, since we'll use these cards to calculate your earnings at the end of today's activities. Today's first exercise is finished. Thank you all for the cooperation.

Before participating in the second exercise, we will ask each of you to fill out a short form. While a coordinator works with you to fill out a form, you are offered snacks that we have prepared for you. It will take approximately 20 minutes. After that, we will start the second exercise.

At this moment coordinators start to help each participant fill out the network-connectivity questionnaire. When all the participants finished the survey, one coordinator will process the information of network connectivity to form 3 different sub groups. Another coordinator is filling up the PAYMENTS SHEET. The rest of coordinators start asking the postgame survey to partici-

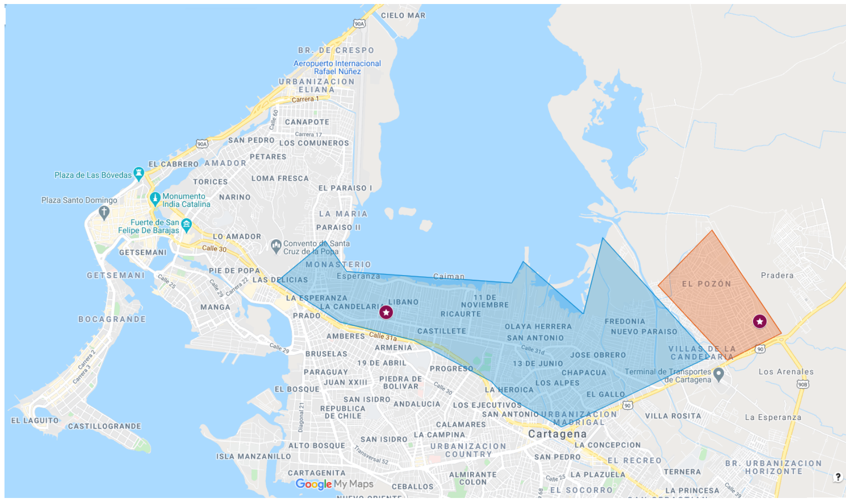

Figure 9: Experimental sites in Cartagena, Colombia. In 2009, Pozón was the most dense zone with 45 thousand inhabitants, while the control zone has 102 thousand inhabitants. Source: http://midas.cartagena.gov.co/ and Map data by Google. Red dots are where the sessions were held. The red area is Pozón and the blue one is the control zone.

pants.

Exercise 2: The Coordination game

Now you will participate in the second exercise. This exercise is independent of the first exercise which you already participated in. Your earnings in this exercise are not related to the decisions you made or earnings you obtained in the first exercise.

In this exercise, each of you will be assigned to one of three groups. Allocation into groups is determined by the coordinators. The allocation into groups will be announced after we explain the exercise. Each group will move to a separate classroom in order to participate in this exercise. After each group finishes the second exercise in a different classroom, we will meet all together again in this room and we will then proceed to calculate your earnings in the first exercise and in the second exercise.

Is there any question? Shall we start?

This exercise consists of a single round in which you will make one decision. In this exercise, each participant in a group will make one decision, individually, simultaneously and in silence. Each participant will choose an individual level of effort to a Group Project. Any participant can neither see nor discuss what other participants in the group choose. There are three possible units of effort, 1,2,3, where “1” may be interpreted as a low level of effort to the Group Project, “2” as a medium level of effort to the Group Project and “3” as a high level of effort to the Group Project. When you are ready to choose, you just need to mark with a cross X the number you wish to choose in the YELLOW DECISION SHEET as this one (see figure A3). In this card, there is the player number and the three possible options of levels of effort. You will choose your low, medium or high level of effort marking the cell with a X.

Exercise 2			
L1	L9		
Player no.	My Decision (level of effort)		
	1	2	3

Figure 10: Decision card, Minimum Effort game

Your earnings in this activity are determined as follows: You will be in a group of 8 or 9 people. At the beginning of the activity, each of you will have \$3,000. Your earnings will depend on your decision and the lowest level of effort among all group members. Your earnings, given by these \$3000 may decrease depending on the level of effort you choose and increase depending on the minimum level of effort in the group.

You decide the level of effort 1, 2 or 3 units of effort. You mark it on your yellow decision sheet. Once everyone in the group has made its decision, a coordinator will collect all yellow decision sheets.

We will know what the minimum level of effort is among all players in the group, this could be 1, 2, or 3 and multiply that minimum effort times \$3000 and each of you win that amount.

If the minimum effort in the group is 1, i.e. the lowest level of effort among all the people in the group is 1, i.e., at least 1 person chose the low level of effort, the earnings for everyone in the group are \$ 3,000 * 1 = \$ 3000.

If the minimum effort in the group is 2, i.e. the lowest level of effort among all the people in the group is 2, i.e., no one chose 1 and at least one person chose the medium level of effort, the earnings for everyone in the group are \$ 3,000 * 2 = \$ 6000.

If the minimum effort in the group is 3, i.e. the lowest level of effort among all the people in the group is 3, i.e., no one chose either 1 or 2 and everyone chose 3, the high level of effort, the earnings for everyone in the group are \$ 3,000 * 3 = \$ 9000. Then you must subtract from those earnings, according to your level of effort, \$2,000 for each unit of effort you decided to add to the group project.

Earnings Table

		Minimum level of effort chosen by the group		
		3	2	1
My decision (level of effort)	3	$ 6	$ 3	$ 0
	2	-	$ 5	$ 2
	1	-	-	$ 4

$ 3
+ $ 3 x Minimum level of effort in the group
- $ 2 x My level of effort

My Earnings

Figure 11: Poster for the Coordination Game

Per unit effort you must subtract $ 2,000: If you choose 1 unit of effort, the cost of this unit is (1*2000 = $2000) and you must subtract from your earnings $2000. If you choose 2 units of effort, the cost of these two units is (2*2000 = $4000) and you must subtract from your earnings $4,000. If you choose 3 units of effort, the cost for these three units is (3*2000 = $6000) and you must subtract from your earnings $6,000.

Which can be summarized in the following table:

The coordinator will show the formula and table on a poster (See figure 11).

In summary, the calculation of your earnings can be seen as follows: My Earnings = $ 3,000 + $ 3,000 X the minimum effort in the group (the lowest level of effort among all group members) - $ 2,000 X each unit effort In brief, your earnings decrease the higher your level of effort and increase the higher the minimum effort in the group.

To help participants understand their earnings, the coordinator will use the examples in that order.

How should we read this table? Each row, called my decision of level of effort indicates the earnings you could obtain for different levels of the minimum effort in the group. For example, if you choose 3, you can either win $6,000, $3,000, or $0. Each column indicates the earnings you could obtain for different minimum levels of effort in the group, i.e., the lowest effort among all effort levels chosen by the group. For example, if the minimum effort level chosen in the group is 2, then you win or $ 3,000 or $ 5,000.

Let's do some examples to understand how earnings are determined. Please pay close attention and feel free to ask if anything is not clear in the examples.

- Suppose you choose an effort level of 1. Since you have chosen the lowest level of effort possible, the minimum effort in your group is 1, regardless other levels of effort that the other participants have chosen.

Then the group project benefit is $3,000 for each member ($3,000*1). Furthermore, the cost of your own effort level that is subtracted from your earnings is $2,000 ($2,000*1). Therefore, your earnings will be $3,000 + $3,000 - $2,000 = $4,000, which is where the row of your effort level 1 intersects with the minimal effort column equal to 1.

- Suppose you choose an effort level 3, and the minimum effort in your group is 1, i.e. among all levels of effort in your group, the lowest one is 1. This means that at least one participant in your group chose an effort level of 1. Since the minimum level of effort in your group is 1, the group project benefit is $3,000 (=$3000*1) for each member. And as your own effort level is 3, the cost of your effort that is subtracted from your earnings is $ 2000 * 3 = $ 6,000. Therefore, your earnings will be $ 3,000 + $ 3,000 - $ 6,000 = $ 0, which is where the row of your effort level 3 intersects with the minimal effort column equal to 1.

- Suppose you choose an effort level of 3, and the minimum effort level in your group is 3. This means that all participants (including yourself) in your group, chose an effort level of 3. Then the group project benefit is $ 9000 (=$3.000 * 3) for each member. And as your own effort level is 3, the cost of your effort that is subtracted from your earnings is $ 2000 * 3 = $ 6,000. Therefore, your earnings will be $ 3,000 + $ 9,000 - $ 6,000 = $ 6,000, which is where the row of your effort level 3 intersects with the minimal effort column equal to 3.

- Suppose you choose an effort level 2 and the minimum effort level in your group is 2. This means that everyone in your group chose or 2 (like you) or 3. Since the minimum effort in your group is 2, the group project benefit is $ 6.000 (= $ 3.000 * 2) for each member. And as your own effort level is 2, the cost of your effort that is subtracted from your earnings is $2000*2 = $4,000. Therefore, your earnings will be $ 3,000 + $ 6,000 - $ 4,000 = $ 5,000, which is where the row of your effort level 2 intersects with the minimal effort column equal to 2.

- Suppose you chose an effort level 2 and the minimum effort level in your group is 1, i.e. among all levels of effort in your group, the lowest one is 1. This means that at least one participant in your group chose an effort level of 1. Since the minimum effort in your group is 1, the group project benefit is $ 3,000 (=$3000*1) for each member. And as your own effort level is 2, the cost of your effort that is subtracted from your earnings is $ 2000 * 2 = $ 4,000. Therefore, your earnings will be $ 3,000 + $

3,000 - $ 4,000 = $ 2,000, which is where the row of your effort level 2 intersects with the minimal effort column equal to 1.

- Suppose you choose an effort level 3 and the minimum level of effort of the group is 2. This means that everyone in your group chose or 2 (like you) or 3. Since the minimum effort in your group is 2, the group project benefit is $ 6.000 (=$3,000*2) for each member. And as your own effort level is 3, the cost of your effort that is subtracted from your earnings is $ 2000 * 3 = $ 6,000. Therefore, your earnings will be $ 3,000 + $ 6,000 - $ 6,000 = $ 3,000, which is where the row of your effort level 3 intersects with the minimal effort column equal to 2.

Note that the more units of effort you choose is more costly for you but that the higher is the minimum effort, you and others in the group earn more.

Are there any questions?

After each group has completed the activity, it will be announced the minimum effort chosen in the group. Then we meet again in this room to finish today's activities. We will announce the number of cards MY TOKEN invested in the group account for the first and second round of the first activity. A coordinator will call you to answer a questionnaire. When you have completed the questionnaire, you will go with another coordinator to calculate the total earnings of the two activities and will receive your total earnings.

Are there any questions? Are there any on this activity? Please do not talk to anyone about the exercise.

Now we will form three groups and announce which group each participant belongs to. From this moment onwards we ask you to remain silent.

Participants are allocated into groups according to the network score. The main coordinator will announce which group each participant is allocated to. There is a room assigned to each group with its assigned coordinator. Please ask participants to remain silent when they move to another room and during the experiment. The main coordinator keeps the group C. Please remain silent when moving from one room to another and during activity.

Each coordinator in his/her group: Let's start the only round of this activity. A coordinator provides the YELLOW CARDS to each participant. Please make sure the player number matches with your player number. Please make your choice by marking an X on the level of effort you want to choose.

At this time, the coordinators give each participant the YELLOW DECISION SHEET according to their player number. Check whether the player number on the sheet is the same as the player number. Once participants have made their decision, the coordinators will collect the YELLOW CARDS in an *envelope and find out the minimum effort in the group. These coordinators must fill out the MONITORS CALCULATION SHEET. Important. When the yellow decision CARDS are collected the coordinator should check whether every participant made a decision.* Today's second exercise is finished. Now we will move back to a classroom where we participated in the first exercise.

Each coordinator announces the results ONLY for his//her group and then, groups gather in the main room. The lowest effort level chosen was, which means that if you decided one unit of effort, your earnings are ... if you decided 2 units of effort your earnings are ... and if you decided 3 units of effort, your earnings are ...

The main coordinator announces the results of the first activity. Participants are called to answer the survey and then receive their earnings. We're going to calculate your earnings and we'll call you one by one. For the first exercise, we are going to announce the number of tokens that were invested in the group account in the two rounds.

Then the coordinator will announce the number of tokens that have been invested in the group account in the two rounds. Afterwards, two coordinators will go behind two desks to calculate each participant's earnings for each round and the final earnings of this exercise. The number of tokens in the group account in the first round was . . . in the second round was. . . This means, in terms of earnings, that in the first round, the group account has earned. . . ($400x the number of tokens = total amount); in the second round. . .

Now each one of you should wait until one of the coordinators calls your name to calculate your earnings and hand you the payment of today's activities. In the meantime, one coordinator will be calling you to ask you to answer a short questionnaire.

We strongly recommend you not to discuss today's activity with someone in next groups because activities for next groups may be different and thus participants in next groups might get confused by receiving incorrect information.