

Cooperation and the Boundaries of the Firm: Theory and Evidence from a Framed-Field Experiment*

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Abstract

This paper explores the impact of the sense of affiliation to a firm on cooperation, both within and across the boundaries of the firm. We provide unique information on the effect of firm boundaries on intrafirm cooperation and control for the effect of the degree of affiliation. Following the formulation of Aguiar et al. (2010) of identity we develop a model which account for the effect of affiliation to the firm on behavior and estimate the weight of identity in individuals' decisions using a framed-field experiment conducted in two firms. We conduct the experiment in the natural environment of the workplace and use information about the actual boundaries of two companies: a parent company and its subsidiary. The experiment is designed to measure the effect of the degree of affiliation on cooperation in a linear public good game. With this field we document differences in intrafirm and intra-corporate group degrees of affiliation. Overall, we find higher levels of contributions than standard results with pools of student subjects in the laboratory. We find the highest cooperation within firms, followed by the intra-corporate group treatment, relative to neutral information control treatment. The same pattern holds for behavior consistency and prescriptions.

Key words: cooperation, firm, identity, boundaries of the firm, voluntary-contribution mechanism, framed field experiment, firm-market continuum hypothesis.

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1 Introduction

Firm boundaries are a central organizational phenomenon. Yet, efficiency explanations of firm boundaries remain dominant, despite evidence that the impact of identity considerations may be greater in numerous cases (Eisenhardt and Santos, 2005). The consistently high rate of managerial failures in mergers and acquisitions. Managers self-reported a failure rate which has been consistently high, at 46-50% in the 1970s (Kitching, 1974) and recent reports within a sample of British crossborder acquisitions being equally at 44-45% (Schoenberg, 2006). Acquisitions represented a \$1.6 trillion volume in 1997 globally (Holmstrom and Roberts, 1998) and a \$1.9 trillion total value in 2004 (Cartwright and Schoenberg, 2006). is a striking illustration of the importance of the impact of firm boundaries on individual identity and behavior inside firms.

In economics, the issue of firm boundaries is usually analyzed through the difference between internal transactions and external transactions (Akerlof and Kranton, 2008) and the debate focuses on the question of whether internal transactions resemble external transactions. On this issue, Coase (1937)'s seminal contribution of the economics of the firm states that there is a fundamental difference between the two, separating the boundaries of the firm transactions that take place in the market from transactions that take place inside the firm. Views on the boundaries of the firm are competing in economics. Eisenhardt and Santos (2005) discuss the relevant of these views, and explain that the transaction-cost perspective is dominant. It assumes that considerations with regards costs are the main reason to allocate economic activity within the firm. Thus management science and economics remain largely focused on efficiency considerations. Yet, in management science, Eisenhardt and Santos (2005) claim that explanations in terms of boundaries of identity may be more important than efficiency explanations of boundaries as they identity boundaries maintain a cohesive work environments and define corporate cultures. Management scholars have studied their impact, location, importance for competence, efficiency, power and identity considerations (Eisenhardt and Santos, 2005).

Firm boundaries are often reconfigured at the occasion of acquisitions, mergers or divestitures. Also, firms are "flattening", outsourcing activities which are not related to their core competences. Yet, inter-firms relationships can be persistent and may result in quasi-integration or strong forms of cooperative agreements (Baudry, 1992, 1993, 1994). This diversity and complexity makes understanding the boundaries of a firm is a challenge for economists. Some tackle the complex issue of the role of organizational features and management in the economics of the firm literature (Baudry, 1999; Hodgson and Knudsen, 2007; Baudry and Chassagnon, 2010), but experimental validation remains scarce.

The motivation of addressing this question is based on the observation that, despite the concern for the role of the nature of the firm in shaping individuals' identity, since the 1970s, many have argued that the distinction between firm and market is negligible or non-existent. Most contributions in economics assume that there is a firm-market continuum, that there is no difference between the two, saying that the same factors are responsible for costs of transactions inside the firm and outside the firm (Williamson, 1973). Jensen and Meckling (1976) state that interactions that take place inside the firm should not be distinguished from those that take place outside. The inherent contractual nature of economic decisions is supposed to blur the boundaries of the firms (Alchian and Woodward, 1988). On this issue, Hodgson (2002) explains how the idea that firm boundaries are "fuzzy and indistinct" became popular as the ideas of "internal markets" within firms, of the "quasifirm", of "hybrid firms" or "hybrid forms", and of "quasi-markets" were rising in the literature. Gindis (2009) further notes that, often, the next step to a hybrid conception of the nature of the firm has been the abandoning of the concept of the firm in favor of other concepts such as "firm-likeness", "firmness" or "firmishness".

Many economists plead for maintaining the distinction. Remarkably, Kogut and Zander (1996) explain that firms are distinct from markets because coordination, communication, and learning are situated physically and cognitively in the firm as it produces identity. Their main argument is that the firm constitutes a "social community" which serves as a space in which knowledge is transferred. Hodgson (1996) further argues that the role of firms is specifically to enforce cooperative patterns, in coherence with the argument that an exclusive focus on opportunism as the reason why firms exist is misleading (Hodgson, 2004). In this line, Akerlof and Kranton (2005, 2008, 2010) defend the idea that there is an inherent difference between the firm and the market as firms create group membership that changes self-perception and behavior.

This chapter addresses experimentally the fundamental question of whether there is more identity inside the firm than outside it and whether this affects cooperation. In other words, what is the effect of firm affiliation on cooperative behavior? Will coworkers cooperate more or less than strangers? Is it the same to be in the same firm or in the same corporate group but in two different firms inside that group? The standard view on the effect of affiliation is that there is no effect, as spending thinking and energy for goals that are not directly linked to strictly self-centered wealth is a cost to individual's welfare. It is not rational for an individual to cooperate at the expense of his/her own energy or own income. Yet, behavioral economists have shown that effort-minimizing strategies are detrimental to motivation and the figure of the alienated workers who feel disconnected from their job tends to be less motivated than those

who build a sense of belonging to their tasks or mission (Ariely et al., 2008).

In this paper we test the validity of the firm-market distinction argument by using framed field experiments resorting to voluntary contribution mechanism¹ The game is a linear public-good game with no communication and a group size of four players. The experimental design uses the natural boundaries of two firms: a parent company and one of its subsidiaries. The increasing importance of complex firm structures and organizational setups requires a fine definition of firm boundaries. Thus, the experimental procedure contains three experimental treatments: an intrafirm treatment, an intra-corporate group treatment and a neutral information treatment. In the intrafirm treatment, subjects are informed that the other players in the group they are assigned to are employees of their own company. In the intra-corporate group treatment, players are taken from both firms and are informed about it. Finally, in the neutral information treatment, subjects are informed that their group is composed of players who are employees of a company located in France. This treatment has no affiliation-related information. The neutral treatment serves as a baseline and as a benchmark to compare to other results obtained in the literature.

The result exposed in this paper characterizes the impact of the boundaries of firms on inter-individual cooperation within them and across their boundaries. Unlike standard results in the laboratory where contributions to the group account decline with repetition and end at a low share of the endowment (Holt and Laury, 2008), aggregated results obtained in this experiment start above 40% of the endowment and remain above 50% of the endowment. Our results are consistent with those obtained in an intergenerational counterfactual field experiment conducted with employees: it displays a higher rate of cooperation among subjects of the same age group (Charness and Villeval, 2009). We find that the highest degrees of cooperation occur within firms and in the intra-corporate group treatment, relative to neutral information control treatment. The same pattern also holds for behavior consistency and behavior prescriptions, as stated in questionnaires. Our results validate Kogut and Zander (1996)'s and Hodgson (1996)'s claim that firms shape individuals' cooperative abilities.

The paper is organized as follows. In the next section, we first introduce the main features of field experiments and explain their roles in economics and we expose the experimental literature on cooperation and theoretical predictions. Section 3 provides a model on the effect of affiliation to decisions in a voluntary contribution mechanism experiment. Section 4 describes the experimental methodology and

¹Framed field experiments are counterfactual field experiments which contain information, environments and procedures that are directly related to the field in accordance with the typology used for economics field experiments (Harrison and List, 2004).

field implementation. Section 5 displays the results. Section 6 concludes.

2 Experimental literature on cooperation and predictions

Cooperation is a central feature of inter-individual interactions inside firms, as economic outcomes emerging from cooperative behaviors inside teams are often greater than solitary work. Yet, despite the benefits that can emerge from cooperation, the possibility of free-riding on others' efforts or contributions when being in a group is made attractive by the difficulty in rewarding individual marginal product and by the highly costly observability or the non-observability of individual actions (Alchian and Demsetz, 1972). The fundamental contribution of the experimental method in economics to the study of cooperation under contradicting motivations has been to show the heterogeneity of actual behaviors and the occurrence of cooperative strategies (Fehr and Gächter, 2000). Individuals' attitudes toward cooperation are often explained in economics using public good games and measured with individual levels and patterns of contributions in voluntary contribution mechanism experiments. The voluntary contribution mechanism is a decision-making experiment which involves alternative investments. The game is repeated. At each period, the subjects are endowed with a number of 'tokens', or experimental dollars or other currencies, and they have to decide whether they want to invest, totally or partially, the money they have in the public exchange or keep their tokens. The money invested in the group exchange has a lower return than the money kept by the individual, but it benefits all the participants of the group, including the contributor, at a rate given by the marginal per capita return.

Voluntary contributions mechanism experiments are used to measure levels of cooperation and study patterns of cooperation in experimental economics. According to the Nash equilibrium, the dominant individual strategy is that players should choose not to contribute to the group account. The typical social optimal strategy is to contribute to the totality of the endowment. When this game is repeated a finite number of rounds, backward-induction implies that the players should not contribute to all rounds. The voluntary contribution game is a public good game, in which a defined number of players, who must simultaneously make the decision to divide the money of their endowment between a private account and group account that benefits the contributors and the other players in the group equally. In voluntary contribution experiments, each player has to decide to either keep the money of their endowment or to invest it in the group account. In most public good games, the money in the group benefits equally the person who contributes but also all other players assigned to the group.

Experimental results strongly indicate that the Nash equilibrium prediction fails with regard to the

level of contributions as it deviates from the Nash equilibrium, and with regard to the average contributions respond to treatments that do not have an effect in a Nash equilibrium. Seminal experiments reporting these results are Isaac and Walker (1988b); Andreoni (1988). Holt and Laury (2008)'s survey of results in voluntary contributions mechanism can be summarized through the following characteristics: (1) they find that on average, contributions to the group account are a significant fraction of the total endowment (in most treatments, more than half of all contribution decisions involve the division of the endowment), (2) an increase in the marginal per capita return leads to higher contributions (especially when the number of participants in the group is small) but contribution of the total endowment is not observed, even when this is a dominant strategy, (3) an increase in group size leads to higher contributions, at least for low values of the marginal per capita return and low-to-moderate group sizes, (4) with most framing, average contributions begin at about 50 percent of the endowment, and decline over time, the decline is not always monotonic and contributions do not disappear, even after a large number of rounds, (5) contributions toward the end of the session are "no lower in long time horizon experiments (40 or 60 rounds) than in short time horizon experiments (10 or 20 rounds)".

The literature on voluntary contributions mechanism experiments has focused on four main questions. The first question, which is of a common type in the experimental economics literature, is concerned with the effect of experiment parameters and types of framing on contributions levels. The second main line of research focuses on ways to improve cooperation by changing the distribution of players in an experiment. They investigate the effect of sorting in experiments, the effect of ostracism and of the selection of types. The third main family of questions has focused on the effect of modes and levels of communication among subjects. The fourth type of question is concerned with the effect of the possibility of punishment on decisions in the game. The debate on the kind of norms that matter in punishment is currently prominent in the literature on voluntary contributions mechanism experiments.

The first research agenda deals with the fundamental question of the effect on decisions of the parameters of the experiments and framing. Laury et al. (1995) report results on the effect of anonymity on contributions. They find that increasing anonymity in the experiment does not affect individual levels and patterns of contributions. Gaechter and Fehr (1999) inquire into the effect of social approval and sanctions on collective action and voluntary cooperation. They investigate the effect of social rewards on individual behavior in the provision of a public good. They find that approval incentives alone are not enough to allow a significant reduction in free-riding. However, they find that when approval is combined with some small incentives, it generates a significant rise in cooperation.

The second line of research focuses on ways to improve cooperation by changing the selection options of participants with regard to their cooperative types. This relates to the comments of Putterman (2004), when he explains how recent experiments illustrate the argument of Henrich (2000)'s point that if altruists can preferentially group with other altruists then altruism is given a chance. For instance, Page et al. (2005) conducted public goods experiments in which subjects were able to partially control the type of subjects they were grouped with. They grouped subjects together according to the mutual preferences of all subjects, so that more cooperative subjects could exclude free-riders from their groups. They find that cooperative types players played together and that their earnings was greater than those of less cooperative players. They observed that within-group variations declined over time, and differences between group increased. Cinyabuguma et al. (2005) further investigate the effect of the threat of exclusion on the levels of cooperation and they find that individuals contribute more under these conditions. Contributions rose to 100% of the endowment, which confirms the intuition that the threat of ostracism enhances cooperation among players. Bohnet and Kubler (2005) investigate the effect of sorting on the level of cooperation. They find that the level of contributions is increased by the possibility to sort among players and match non-utility maximizer players with similar players increases the level of cooperation. However, this level decreases overtime and cooperation deteriorates as sorting is incomplete. Ehrhart and Keser (1999) also study the effect of giving the option to sort among players. But as their design does not block the entry of free-riders in cooperative groups, cooperation declines over time.

The third main research agenda on communication is central to the study of cooperation in organizations. The seminal papers on the subjects lead to clear conclusions, which illustrate and explain the effect of different types of communication on experiments. Isaac and Walker (1988b) first found that communication increases contributions. The main findings are that communication can affect cooperation positively but the results depend on the type of communication. Bochet et al. (2006) study the effect of different types of communication on patterns and levels of cooperation. They distinguish face-to-face communication in which participants in the group are given the opportunity to talk during five minutes before the experiment. In this case, the average individual contribution is the total of the endowments in more than half the periods, more than 90% in the remaining periods and declining only to 80% in the last period. Chat-room treatment in which participants were brought together in an on-line chat room before the 1st, 4th, and 7th of the ten periods. Numerical cheap talk treatment allows subjects at the beginning of each period to type in possible contribution levels. They find that face-to-face communication is a lot more effective in maintaining cooperation over time, while numerical cheap talk leads to a rapid deterio-

ration of cooperation levels. Bochet and Putterman (2009) find that letting subjects make non-binding numerical announcements about their possible contributions were responded to by others' announcements and by real play. Putterman (2009) further discusses the recent experimental results on the positive effect of non-binding commitments on cooperation, which may lead to reconsider the assumptions about human motivation and behavior.

The agenda of research on the role of punishment in triggering cooperation is central in experimental economics. It has been shown that peer punishment tends to increase group cooperation. The impact of punishment opportunity on the level of cooperation has been largely investigated (Fehr and Gächter, 2000, 2002) and it has been shown that even the wording of punishments as a disapproval has a significant impact on cooperation and level of contribution to the public good (Masclot et al., 2003). Current literature now investigates the motivations of punishments and more particularly questions the role of norms (Casaria and Luinib, 2009; Carpenter and Matthews, 2009). The debate focuses on the question of how cooperative norms can emerge and what norms and motives drive individuals to punish others. Casaria and Luinib (2009) compare alternative punishment institutions and find that higher cooperation levels are displayed when punishment institutions are more consensual than when chosen by individuals. They also find that sequential versus simultaneous punishment institutions trigger similar levels of cooperation. Bochet and Putterman (2009) find that communication before the game through announcements can increase efficiency by replacing costly punishments by cost-free warnings.

Individuals engage in cooperation in various economic contexts and in various group sizes (Fehr and Gächter, 2002). This makes the task of explaining cooperative motives extremely hard to economists. Public good experiments challenge economics theory as data generated in experiments consistently deviate from standard theoretical predictions. The proportion of subjects evincing high patterns of contribution to the public good is relatively high (Holt and Laury, 2008). Competing theories on cooperation in economics underline either, in the case of the evolutionary theory, the role of the selection process or, in the case of signal-based or altruism-based theories, the importance of self-centered motives (Fehr and Gächter, 2002). Holt and Laury (2008) review the main explanations to contributions to the public good. They distinguish the generalized preferences for altruism and fairness models, noisy decision-making models, "cooperative" responses and the role of signals in evolutionary adaptation to desirable outcomes. To this classification can be added the model of inequity aversion (Fehr and Schmidt, 1999).

Standard findings in voluntary contribution experiments display contributions which begin at 50% or more of individual endowment, and decline with repetition (Davis and Holt, 1993; Ledyard, 1995). Most

of the results obtained are not consistent with the standard predictions, the Nash equilibrium implying no contributions and most subjects choosing to divide their endowment between the private and the public exchanges. Hence, with a similar design to the one of this study, the results from lab experiments with no punishment opportunity, no communication opportunity and a student subject pool begin at an average of 62.9% of endowments and decline to 19.6% of endowments in the last period (Bochet et al., 2006). Unlike standard results where contributions to the group account decline with repetition and end around 20% of the endowment and in accordance with recent results obtained in the field with the same game (Charness and Villeval, 2009), this study displays aggregated results which start above 40% of the endowment and remain above 50% of the endowment, showing strong intra-group cooperation and differences across treatments. The study measures intra-group cooperation in three treatments: a neutral information treatment, an intra-firm treatment, conducted in both firms and an intra-corporate treatment. The main results display higher levels of contribution to the group account and higher cooperation than results obtained in the laboratory and differences across treatments, a greater share of subjects adopting a cooperative strategy in the intra-firm and intra-corporate treatments.

Cooperation among players occurs in a voluntary contribution experiment when contributions do not follow a declining path. Variations from the dominant declining cooperative behavior have been observed in presence of communication, punishments and under framing effects. Framing effects were rapidly brought to light by the large occurrence of observed concern for fairness in subjects' behavior in experiments. Isaac et al. (1991) first explained that the perception of fairness can vary according to contexts and institutional settings. Then Frey and Bohnet (1995) strongly advocated for the institutional implementations of elements that could support the examination of the impact of fairness on economic outcomes. Framing effects include "norms, perspectives, contexts, and other social and cultural elements" (Elliott et al., 1998). They refer to the effect of frames, the manner in which decisions are presented, and how they can influence and shape human decisions in a particular setting. Tversky and Kahneman (1979) stated that framing effects are constitutive of the first "framing and editing" phase of preliminary analysis in the decision problem as exposed in prospect theory, the second phase being a phase of evaluation. Taking note that "the deviations of actual behavior from the normative model are too widespread to be ignored", Tversky and Kahneman (1981, 1986) discussed the role of framing effects which they define by "the manner in which the choice problem is presented as well as by norms, habits, and expectancies of the decision maker".

Experimental evidence on cooperation behaviors and motives in the firm remains scarce. However,

some patterns regarding cooperation among individuals can be identified. Charness and Villeval (2009) show striking evidence of the occurrence of higher contributions in an intergenerational experiment conducted in two companies in the field, as working seniors and working juniors invested respectively 7.46 and 6.41 and students contributed a standard percentage of 4.13 out of 10 units of endowment. Fehr et al. (1997) discuss the impact of the employment relationship on individuals' willingness to display high level of efforts by placing individuals in an experimental design that sets up "employees" and "employers". Subjects assigned to playing the employees are given the opportunity to free-ride on the wage offered, given the non-enforceability of the contracts, but they do not. Conducted with students, subjects provided evidence that a non-negligible part of them displayed cooperative behavior and that similarly subjects expect cooperative behavior to be displayed by others.

In another experiment conducted in the lab with students, Elliott et al. (1998) show experimentally that the mere fact of getting subjects to read about a specific type of business strategy has an impact on their following investment decisions, the cooperative form of production, over the entrepreneurship form, eliciting higher contributions. About voluntary contributions mechanism, Charness and Villeval (2009) and Elliott et al. (1998) showed in previous experiments with strong framing effects in laboratory that subjects tend to contribute higher proportions of their endowments when playing in the field. Martino et al. (2006) find that framing effects are associated with amygdala activity, which supports, as argued by the authors, the hypothesis that the emotional system plays a key role in mediating biases in decisions. Bandiera et al. (2008) analyze friendship networks in the workplace and their impact on firms' performance. They find that workers are more likely to be friends with co-workers with a similar time of arrival, nationality and geographical location and that they are more likely to form new friends with those of the same gender and age, and with those having a similar employment history. This findings are coherent with Branas-Garza et al. (2005) who find that experimental subjects favor their friends in dictator games, when they are certain that the recipient is a friend.

Previous evidence on cooperation in environments related to business firms allows the identification of the two following hypotheses. Hypothesis 1 deals with the question of the impact of firm affiliation on cooperation among individuals and hypothesis 2 includes a concern for the impact of social distance in the firm on cooperation.

HYPOTHESIS 1: *Firm affiliation enhances cooperative behavior.*

HYPOTHESIS 2: *Decreasing level of affiliation among players weakens cooperation.*

3 The theoretical model

We use the formulation of Aguiar et al. (2010) of the effect of identity motivations on decisions in situations in which individuals have to make a decision on how to divide an endowment between private consumption and group investment. We apply this model to voluntary contributions mechanism experiments. Aguiar et al. (2010) provide a general model of the effect of identity on decisions, that we apply to decisions in voluntary contributions mechanism experiments. We deviate from their general model formulation of the problem by explaining how individuals may use cooperative decisions to increase the weight they give to identity. This formalization provides an explanation of how individuals' identity affects decisions when being in a firm and engaging in cooperative interactions.

Assume that a population of N individuals plays a voluntary contributions game. As in Aguiar et al. (2010), individuals have conflicting motivations as regards the use of the money they are endowed with. $S = x_i + g_i$ describes the amount of money each individual has to divide. g_i is the amount that the individual i assigns to the group account, with $g_i \in [0; S]$. x_i the money the economic agent keeps, with $x_i \in [0; S]$ at each round $r = 1, 2, \dots, n$.

The sequence of actions in the voluntary-contributions mechanism experiment is as follows. First, individuals make a decision about how to divide their endowment. In our view, the model of Aguiar et al. (2010) on the trade-off between identity and consumption fundamentally captures the decision process that most individuals engage in when making a decision as regards how to split a money endowment. This applies to dictator games and voluntary contribution mechanism experiments. In a sequential representation of cooperation, the outcome of cooperative decisions are the results of separate individuals' decisions. λx_j is the result of group cooperation. First, all players in the group assign their decisions simultaneously. This implies that they do not know how much other members of the group will contribute to the group account before they decide on how to split their endowments. Second, they see how much others contributed and get the total payoff. Thus, in the "decision-making" part of a round, the individual faces a trade-off which is fundamentally similar to the one that players in a dictator game face.

The level of contributions to the group account has to be inserted in the individuals' overall utility as it ultimately provides them with utility but not in the maximization calculation – when assuming that the individual decision process a trade-off between the individual's own consumption and identity². The individual derives utility at period t from the money he/she keeps x_i , from his/her sense of identity I_i and

²Note that Akerlof and Kranton (2005) consider that it is the identity of the individual that is exogenous to the decision process and included in the overall utility, by formulating the individual overall identity as: $U(y, e; c) = \ln y - e + I_c + t_c |e^*(c) - e|$

from the money gained from the group account λx_j , with λ the return on investment i.e. the marginal return per capita. His/her utility function can be represented as:

$$U_i = U_i(I_i; x_i; \lambda x_j) \quad (1)$$

As in Aguiar et al. (2010), the level of identity I represents a stock of identity that each individual has. Identity I_i of individual i is defined by:³

$$I_i = I - c_i \quad (2)$$

$$c_i = (x_i - p_{ii}) \quad (3)$$

$$x_i \in [0, S] \quad (4)$$

We assume that individuals have a set of behavioral prescriptions which are affected by the context of the firm. Behavioral prescriptions P_i are normative principles that each individual formulates concerning how he/she should divide his/her endowment S : p_{ii} is the amount of money to keep and p_{ij} the amount to invest, with $p_{ii} + p_{ij} = S$. Following Aguiar et al. (2010)'s procedure we capture the trade-off using a Cobb-Douglas utility function in which the character α represents the weight given by the individual to identity. Utility can be rewritten as:

$$U_i = I_i^{\alpha_i} x_i^{1-\alpha_i} - g_i + \lambda x_j \quad (5)$$

As in Aguiar et al. (2010), inserting the weight that individuals give to identity leads to the reformulation of the maximization problem:

$$\max_{x_i, I_i, x_j} [I - (x_i - p_{ii})]^{\alpha_i} x_i^{1-\alpha_i} - g_i + \lambda x_j \quad (6)$$

The following optimal solution is equally coherent the formulation of individuals' decision as in Aguiar et al. (2010). The optimal consumption given by the First Order Condition is in Equation 7; note that $x_i \in [0, S]$ has to hold so that $x_i \leq S$. The corner solution for $x_i = S$ is Equation 8. Note that no contribution is the dominant strategy for every subject in all periods as a unique subgame perfect equilibrium if the number of periods is finite. The conventional utility maximization model predicts that

³As Aguiar et al. (2010), we ignore $x_i < p_{ii}$, which allows to write Equation 3

the public good will not be provided, even if it is not a socially optimal allocation.⁴ This formulation is coherent with the Nash equilibrium in voluntary contribution mechanism experiment which stipulate that it is optimal individually to contribute nothing and that individual utility is affected by the individual's own consumption and by individual's earnings from the group account (Holt and Laury, 2008).

$$x_i = (1 - \alpha_i)[I + p_{ii}] \quad (7)$$

$$x_i = \min\{(1 - \alpha_i)(I + p_{ii}), S\} \quad (8)$$

As Aguiar et al. (2010), we provide estimate of the weight given to identity by subjects by using:

$$\hat{\alpha}_i = 1 - \frac{\tilde{x}_i}{[\tilde{I} + \tilde{p}_{ii}]} \quad (9)$$

The experiment described below provides information about how individuals' decisions evolve in a voluntary contribution experiment which tests the effect of identity on behavior. We document and analyze the effect of firm boundaries on cooperation. We approximate the weight given to identity by individuals and identify the effect of treatments on the weight to identity and also analyze the evolution of individual consumption.

4 Experimental design and field implementation

Economists have long been interested in the question of cooperation. This interest has generated numerous laboratory experiments and the literature provides abundant data on behavior in voluntary contribution mechanisms⁵ Often conducted with students and in the standardized environment of the laboratory, laboratory experiments in economics can measure the effect of a treatment on behavior in specific games. Field experiments, on the contrary, are less standardized and often offer results which do not allow to identify the effect of a treatment on behavior. However, their function is to inform economists about ways with which economic phenomena present themselves in the field.

Our research aims at identifying the effect of firm boundaries on cooperation. The abundance of data on cooperative patterns of behaviors in the laboratory allowed us to conduct a framed field experiment,

⁴The payoff of subject i as regards his/her contribution $x_i - g_i + \lambda x_j$ with g_i the contribution of individual i to the group account and λ the marginal per capita return on investment of the group account. The derivative of U_i , with respect to x_j is $-1 + \lambda$ (since λ is smaller than 1, $(-1 + \lambda)$ is negative). U_i is maximized when $g_i = 0$.

⁵Holt and Laury (2008) survey findings of voluntary contributions mechanisms experiments.

using actual firm boundaries. Framed field experiments are experiments which replicate the tasks of lab or counterfactual field experiments but with elements that are directly taken from the environment. In our study, we used real affiliations to firms. Also, we conducted experiments in the workplace and not in a laboratory in order not to induce beliefs about the research question or purpose and not to reveal the existence of different treatments to the subjects. The subjects were informed that the experiment was for research purposes only.

The experiment was conducted with employees of two companies, hereafter Firm 1 and Firm 2. Firm 1 was composed of 180 employees at the time when the experiment was conducted. Firm 2 was composed of around 40 employees. The particularity of this field is that Firm 1 is the parent company of Firm 2 and that both companies are in the same broad technological domain. The two firms are companies behind leading European websites. The parent company (Firm 1) is a leading Europe e-shopping website. The subsidiary (Firm 2) is the company behind a leading advertising website. The particularity of Firm 1 and Firm 2 is that they both have subdivisions which implement similar production and operational processes. They both manage important commercial websites. In total, 92 subjects participated in the experiment. 77 were drawn from Firm 1 and 15 were drawn from Firm 2. The participants played the game from their own computers and desktops. Firm 1 is in a building composed of different floors. Each floor is organized around an open space and all rooms are separated by glass walls. Firm 2 is located in offices adjacent to Firm 1's building. Firm 2's workplace is composed of open spaces separated by glass walls and with individual desks and desktops.

The decision to run the experiment in this field was motivated by several factors. First, they offered a unique setting in which employees were in two different firms but part of the same corporate group. The workplace organization also reflected the organizational structure as both firms were in the same building, but in different parts in the building. They shared a common entrance hall and some facilities but most of the interindividual interactions that are related to work happened in their respective building. The presence of the two companies in the same building allowed for the intra-corporate group treatment. Second, we chose these firms because they were medium-sized and had comparable technology, organizational goals and organizational structures. A very important aspect in our decision was that a main organizational subdivision in the firm was based on a division into products. In this type of firm, the operational process is organized through the division into products and the operational process accounts for the effect of in order to avoid firms in which there could be corporate cultures specific to divisions or locations. The decision to choose this corporate group was motivated by the presence of a similar

horizontal organizational structure in both firms. In this type of firm, tasks and processes are repeated in several departments. Thus, there is no central value chain, but several similar value chains which coexist. The internal organization of these firms is mainly structured by the division into products and information processes. It is important to report that the tasks operated by employees have a particularity. Employees perform similar tasks on products which are similar, but they deal with different geographical selling zones. Thus, the valuation of individual performance and the interpersonal comparison seem easier to operate in Firm 2 than in the case of Firm 1. Employees in Firm 1 operate similar tasks, but on different products, which makes interpersonal comparison of performance more difficult than in the case of Firm 1.

The design consists of three treatments as described in Table 1. The first treatment is a baseline where players are given the neutral information that they are playing with employees of a company in France and which serves as a benchmark to current results in the laboratory with students. In order to compare our results those of Bochet et al. (2006), we replicated the baseline treatment used by Bochet et al. (2006). The second treatment is an intra-firm treatment where subjects are informed that they play with other employees of their own respective companies. The third treatment is an intra-corporate treatment, in which players are drawn from the two companies and are informed that players in their group are composed as follows. Both companies are with the same building, but that they are in two separate parts of the building. They share the hall and some facilities, but most of the tasks that employees undertake are in separate areas. In the situation, individuals can know each other but they rarely interact for work purposes. Second, it provides a measure of the effect of degree of affiliation to the firm. The neutral information treatment does not trigger a sense of affiliation. Thus it serves as a baseline. The intra-corporate group treatment does allow the an "intermediate" sense of affiliation to the corporate group, which includes the parent firm and the subsidiary. And in the intrafirm in Firm 1 and in Firm 2 discuss the effect of the sense of affiliation to the firm itself.

Each participant from each firm was randomly assigned to a four-player group⁶, conditional on the experimental design and individuals' real affiliation to each firm. We decided to design the experiment with four players so our design is comparable to the large data literature on voluntary contribution mechanism. Subjects played a voluntary contribution mechanism without punishment and communication opportunities. The marginal return per capita for each dollar invested in the group account was 0.4 per dollar. Contribution would be beneficial enough for individuals to have an incentive to cooperate. So it is

⁶Note that Charness and Villeval (2009) designed their experiments with groups of three subjects.

socially beneficial to contribute the full endowment and individually beneficial to contribute nothing. Each round endowment amounted to 10 experimental dollars, so players were given a total of 100 experimental dollars. The earnings were converted at a rate of 0.13 euros cents for payment per \$1 in the experiment. We decided to chose relatively high stakes in order to motivate the subjects. The earnings of individual i are defined for each period Equation 10 where g_i are the contributions that individual i assigns to the group account and the sum takes into account all members of i 's group.

$$E_i = 10 - g_i + (0.4) \sum_{j=0}^4 x_j \quad (10)$$

Table 1: Design of the three experimental treatments

Treatment	Sample	N	Information regarding firm boundaries
Neutral information	Firm 1		"The participants in your group
	7 groups	28	are employees of a company located in France"
Intra-corporate group	Firm 1 and Firm 2		The participants in your group
	8 groups	32	are employees of [the name of Firm 1] and [the name of Firm 2] "
Intrafirms	8 groups	32	"The participants in your group
			are employees of [the name of Firm 1 or of Firm 2]
<i>s.t.</i> Intrafirm 1	Firm 1		"The participants in your group
	6 groups	24	are employees of [the name of Firm 1] "
<i>s.t.</i> Intrafirm 2	Firm 2		The participants in your group
	2 groups	8	are employees of [the name of Firm 2] "

Employees of the two companies were informed of the possibility by email to participate in the experiment a week before the experiment and by using an information and consent letter. The first email was sent by an employee of the company who was not part of the management. Subjects were given information about the identity and research affiliation of the experimenter. They were told that the study was for research purpose only and that information would be available in the form of scientific publications. Subjects were also informed of the monetary rewards. In addition to the monetary rewards and in order to motivate subjects to participate in the study, we informed them of the possibility to ask for a post-experiment personalized report on the subject's behavior only and about explanations of the aims of experimental research in firms⁷.

⁷8 subjects asked for a report. The reports explained individual strategies only and provided some information about the use of experimental research to study behavior.

The experiment was conducted with the Veconlab public good game interface. The experiment was presented as a study on decision-making and subjects were not informed that the experimental design was composed of different treatments. In addition to the Veconlab instructions, the summary of the instructions of the Veconlab software was translated into the local language and sent by email along with login information and information about the firm affiliation of the subjects who composed the group. The information about the affiliation of the other participants in the group was written in bold and was repeated twice in the email so participants see the information.

Vocabulary in the instructions was neutral, using the terms "participants" and not "subjects", "group" and not "team" and "employees" and not "collaborators", which are often used by business practitioners. To match the summary instructions in the email with the Veconlab instructions, the word "invest" was translated into ("investir") and the word "keep" was translated into ("garder") to describe individual decision on how to allocate money. The words have the same neutral connotation in both language. In the summary instructions, the earnings gained from the decision to keep the endowment were presented first in order to avoid biasing to subjects with a cooperative mind-set. The numbers used in the examples were small, in order to ensure understanding of the pay-off scheme.

All participants played the game at the same time and from their own desks and desktops. This field implementation procedure was chosen for several reasons. First, we implemented our design with this procedure because of the risk of information propagation of the task on the experiment and on the existence of different treatments inside the firms. Second, this procedure aimed to avoid collusion or other forms of pre-experiment arrangements. The instructions were sent by email and not given in the form of printed pages to avoid pre-experiment communication. The consent and information letter and instructions which were distributed to the participants stated that communication was not permitted. The experimenter repeated orally this instruction to participants before the experiment. No case of communication was reported. The Veconlab software generates identity numbers which insured anonymity.

5 Results

5.1 Descriptive statistics and graphical representations of the contributions to the group account

Contributions The aggregated individuals' mean contribution to the group account displayed in Table 2 is higher than standard results obtained in the laboratory. Table 2 shows that the mean contributions to

the group account are higher than results obtained in the laboratory with students in similar experiments with no communication or punishment opportunities but similar to those observed in the counterfactual field experiments of Charness and Villeval (2009) for the same age group⁸. Results from the test to compare treatment from the baseline on individual contributions show that the null hypothesis is rejected for most rounds at the beginning of the experiments but that the null hypothesis is not rejected at for the other rounds.

RESULT 1: *Mean individual contributions to the group account are higher than standard results.*

Table 2: Mean individual contribution and standard deviations per treatment

Treatment	All treatments	Neutral information	Intra-corporate	Intrafirms Firm 1	Intrafirm Firm 2	Intrafirm group
Mean individual contribution	5.81	6.18	6.25	5.43	5.84	4.26
(st. dev.)	3.31	3.22	3.16	3.39	3.36	3.26

By using the methodology of Hichri and Kirman (2007)⁹, we describe the history of contributions of subjects in the experiment. We find that the percentage of subjects who increase their contributions is higher in the intrafirm treatment for Firm 1 and that the highest percentage of decrease is found in the neutral information treatment. The percentage of subjects who display unchanged decisions is the highest in the neutral information treatment and in the intra-corporate group until round 7 in which the proportion of subjects not changing their decision is greater in the intrafirm for Firm 1. The mean history of contributions per round and per treatment which summarizes the mean variation from one round to the next shows that subjects in the intrafirm treatment for Firm 1 have increases which are higher and decreases which are lower than in the other treatment, with the exception of the intrafirm treatment for Firm 2.

We find that the percentage of individuals increasing their contributions from round 1 to round 2 is the highest in the intrafirm for Firm 2. In all other treatments, about 60% of the subjects increase their contributions. This result differs from standard results in which contributions are typically high in the first round and then decline over time. The percentage of subjects increasing their contributions remains above 30% in about all the rounds of the experiment and for all treatments with the exception of the intra-corporate firm one for which there is a drop at the end of the game. The percentage of individuals in

⁸Note that Charness and Villeval (2009)'s experimental design retained groups of 3 individuals.

⁹Also in Kirman (2011)

the intrafirm for Firm 1 increasing their contributions is higher than the neutral information and the intra-corporate group treatment. We find that decline in contributions intervenes first in the neutral information treatment, where about 30% of the subjects decrease their contributions, which is more consistent with standard results than the data generated by the other treatments. In the intrafirm treatment for Firm 1, the percentage of decrease is the highest in round 4 and then it declines down to about 20% in the last round. Percentages of subjects who decline their contributions in the neutral information treatment and in the intra-corporate group higher than the other treatments in most rounds, and the results show that in the two treatments about 50% of the subjects display an end-game strategy. The percentage of subjects who display unchanged decisions from one round to the next in the experiment is higher in the neutral information treatment and in the intra-corporate group treatment in the first round. It then decreases. On the contrary, the percentage of subjects displaying unchanged decisions in the intrafirm Firm treatment becomes higher in the intrafirm treatment for Firm 1 in the last round. The data in Firm 2 displays a lot of volatility, which is reflected in the low proportion of individuals who do not change their decisions from one round to the next.

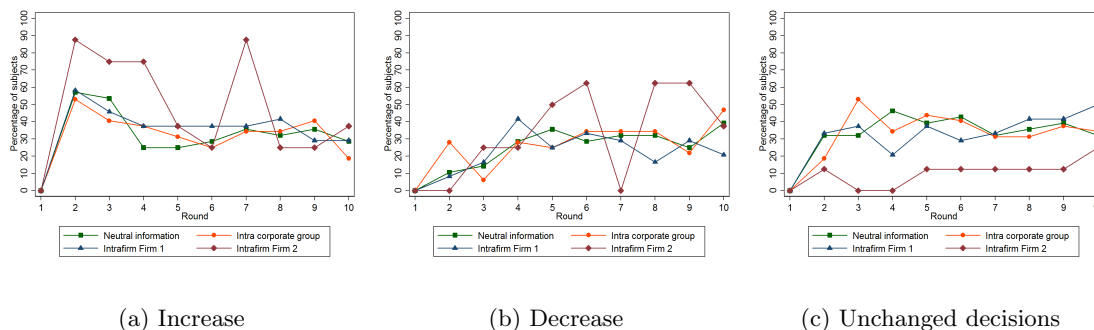


Figure 1: Percentage of increase, decrease and unchanged individual contributions in t compared to $t - 1$ per treatment

Graphical representations Graphical representations of the results display aggregated mean contributions per treatment and per round. Contributions in the neutral information treatment shows that mean contributions to the group exchange increase in the first three rounds and then decrease. These results replicate the declining path that is the standard result in similar experiments with students in the laboratory. The data displays an end-game effect, as players decrease their contributions in the last round of the game. This result replicates the previous findings on the importance of belonging to a firm in establishing cooperation. The only treatment in which there is no decline in the study conducted by Charness and Villeval (2009) is in the actefactual field experiments with senior workers. The results of

the intra-corporate group treatment stand as an intermediary outcome between the intra-firms and the neutral treatments. The impact of social distance, as defined by the boundaries of the firm, has the following impact on aggregated measures of cooperation. End-game effects, which are a sudden decline in the level of contribution to the public account, are observed when social distance is high, in the intra-corporate group and the neutral information treatments. There is no end-game effect in the intrafirm treatments. Contributions in the intrafirm treatment for firm 1 increase significantly in the first three rounds and remain stable afterwards. The last round differs from what is found in the usual voluntary contributions mechanism where individuals act strategically and free-ride in the last round or the last few rounds. The data shows that 50% of the sample contribute 8 dollars or more in the last round. Differences in levels of contributions across treatments are mainly caused by the differences in the first rounds of the game. As in standard results, contributions to the group accounts in the neutral information treatment are high in the first rounds and then decline. They are of 4.68 in the first round, 6.21 in the second round and 7.25 in the third round and decline afterwards with the exception of the 8th round in which there is a slight increase. Initial contributions in the intrafirm treatments are lower (3.31 in the first round, 4.63 in the second round and 6.09 in the third round) but then they remain around \$6 in all rounds.

RESULT 2: *Standard declining cooperative patterns of behaviors are observed in the neutral information treatment and contributions in intrafirm treatments do not decline.*

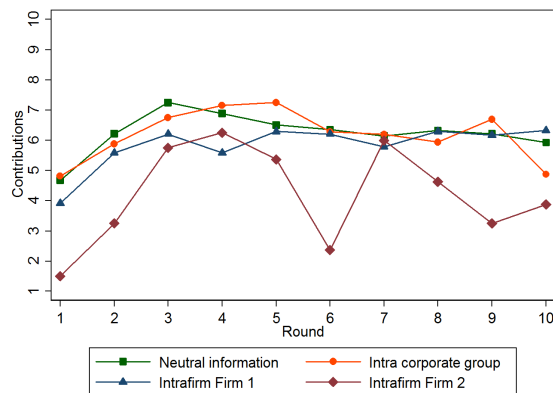


Figure 2: Mean individual contributions per round and per treatment

5.2 Earnings

Subjects were given a sign-up fee of 10 euros. Earnings in the experiment were converted at a rate of 0.13 euros for 1 experimental dollar earned in the game, resulting in the following payment scheme. The rest

of the reward was based on the performance during the experiment. Subjects were paid on average 17.63 euros for their performance, with a maximum of 23.55 (in total 33.55) and a minimum of 10.712 (in total 20.712)¹⁰. Table ?? shows that the standard deviation is higher in the intrafirm Firm 1 treatment than in other treatments.

Table 3: Individual earning data

Treatments	Obs.	Mean	Std. Dev.	Min	Max
All treatments	92	135.65	19.06	82.4	181.2
Neutral information	28	137.5	18.29	97.2	181.2
Intra corporate group	32	137.08	17.82	98.6	172.6
Intrafirm Firm 1	24	135.02	23.06	82.4	174.4
Intrafirm Firm 2	8	125.35	11.54	113	147.2

5.3 Demographics of the experiment sessions

A difference between laboratory experiments and field experiments is that subjects taken from the field have characteristics which have to be reported by the experimenter in order to provide the literature with a detailed description of the type of subject pool. In Table 4 we report the effect of the socio-demographic characteristics of the subject pool on contribution decisions. The socio-demographic characteristics of the population present the following features. The homogenous characteristics are education and positions in the companies. The socio-demographic characteristics which have a skewed distribution are gender, age and tenure. To summarize the effect of socio-demographic characteristics on the levels of contributions to the group account per treatment, the sticking results are that (a) women contribute less than men, (b) having a Master’s degree is associated with lower contributions, (c) being above 35 years old is associated with higher contributions, (d) being an employee for a longer period is associated with higher levels of cooperation, which is consistent with Charness and Villeval (2009), (e) being a director is associated with higher contributions and (f) being a manager or an assistant is associated with lower contributions.

Education As regards education, about 90% of the population has an higher education degree. Apart from the low number of individuals holding a PhD, the proportion of the different types of education background is spread across the population, which ensures a certain diversity as regard to this characteristic. Table 4 shows that holding a PhD or a Master degree from a Business School or an Engineering School positively affects contributions to the group account in the neutral information treatment, the

¹⁰There was a double connection in the Intrafirm Firm 2, which canceled one group. Participants in this group were paid the sign-up fee.

intra-corporate group treatment and the intrafirm for Firm 1 treatment. Having a Master degree from a University program or a Bachelor degree negatively affects contributions to the group account in the neutral information treatment and in the intrafirm for Firm 1 treatment. The results hold when the overall population is considered.

Position Ten different types of positions were identified at all levels of the hierarchy, ranging from interns to directors. We find that hierarchy has an effect on levels of contributions. The fact of being a director increases the level of contributions. Managers, who are directly below directors, have lower contributions. The results hold across treatments and the overall pool. Interestingly, the fact of being in an internship causes a significant increase in contribution (interns often aim at acquiring long-term positions in companies, as reported by one of the interns who participated in the experiment). The fact of being an agent or an assistant decreases contributions.

Gender About 70% of the subjects who answered the questionnaire are males. It must be noted that only self-reported gender is accounted here. An average male contributes more than a woman. In the Intrafirm for Firm 1 treatment, we find that being a male affects contributions to the group account very positively. The results hold for the overall pool.

Age Another particularity of the data is that about 80% of the population is composed of individuals who are below the age of 35. This data characteristic is important if we refer from Charness and Villeval (2009) who find that young workers contribute less than older workers. Our results are consistent with theirs, as reported in Table 4. In the neutral information treatment, the age variable affect contributions positively when workers are above 35, and negatively when workers are below 34. When considering the overall pool, the effect of age remains significant for the oldest subjects.

Tenure Finally, another particularity of our data is that 50% of the subjects have been employees in the company or a year. As regards the effect of tenure, the results differ across treatments. In the neutral information baseline, being in the company for more than four years affects contributions positively. In the intra-corporate group, being in the first year and the fourth year of tenure affects negatively contributions while being in the second and third year affects contributions positively. The results hold in the case of the intrafirm for Firm 1 treatment in which the fact of being in the second year affects contributions positively and the fact of being in the fourth year affects contributions negatively.

Table 4: Determinants of Cooperation in the Voluntary-Contribution Mechanism Experiment per treatment (DV: Contributions to the group account)

IV	Neutral information		Intra-corporate group		Intrafirm Firm 1		Intrafirm Firm 2		All treatments	
	Coeff.	St. er.	Coeff.	St. er.	Coeff.	St. er.	Coeff.	St. er.	Coeff.	St. er.
Male	0.449	0.420	0.371	0.432	2.2***	0.562	1.53, bs	0.853	0.829***	0.254
Female	-0.449	0.420	-0.371	0.432	-2.2***	0.562	-1.53, bs	0.853	-0.829***	0.2548
High School	-1.392	1.037	-0.354	1.031	-0.763	0.579	0.883	1.123	-0.712, bs	0.410
2 years	0.497	0.507	1.099*	0.427	-0.595	0.502	-1.8	1.106	0.345	0.267
Bachelor	0.868, bs	0.505	-1.744**	0.540	-0.055	0.780	0.891	0.790	-0.461	0.296
Master	-1.299**	0.413	-1.9***	0.490	0.137	0.503	no obs.	no obs.	-0.761***	0.266
Business & Engin.	1.116*	0.503	1.021*	0.469	1.405*	0.573	-0.866	1.123	1.08***	0.287
PhD	-1.08	1.039	3.291**	1.010	no obs.	no obs.	no obs.	no obs.	1.311, bs	0.742
24 or less	0.708, bs	0.473	-0.523	0.550	0.009	0.456	-0.658	0.793	-0.135	0.259
25-34	-2.163***	0.389	0.4	0.412	0.423	0.455	1.091	0.786	-0.242	0.232
35-44	2.556***	0.606	-0.140	0.473	-0.702	0.579	-0.866	1.123	0.303	0.305
45-54	3.392***	1.019	no obs.	no obs.	no obs.	no obs.	no obs.	no obs.	3.522***	1.037
11 For 1 year	-0.284	0.401	-1.326**	0.395	-0.554	0.4471	1.733*	0.769	-0.462*	0.231
For 2 years	-3.941***	0.710	1.648**	0.541	2.505***	0.556	no obs.	no obs.	0.901**	0.349
For 3 years	-0.745	0.750	1.083*	0.547	-0.521	0.652	0.883	1.123	0.158	0.350
For 4 years	1.413**	0.5	-2.229 *	1.022	-2.357*	1.065	-1.8	1.106	-0.079	0.386
For 5 years +	1.802**	0.616	0.369	0.551	-0.598	0.652	-0.866	1.12	0.386	0.336
Product manager	-0.666	0.506	-1.812, bs	1.025	-4.07***	0.730	no obs.	no obs.	-1.454***	0.383
Project manager	-1.612*	0.744	0.428	0.550	-1.045	0.777	no obs.	no obs.	-0.287	0.386
Director	2.093***	0.413	1.202 **	0.546	0.752	0.651	2.39**	0.824	1.519***	0.278
Analyst	0.484	0.626	0.560	0.621	-0.680	1.07	no obs.	no obs.	0.540	0.410
Agent	no obs.	no obs.	-6.5***	0.945	0.794	0.579	-0.866	1.123	-1.031	0.439
Assistant	-2.078**	0.613	-1.087*	0.445	-0.641	0.501	-1.683	1.109	-1.087***	0.281
Engineer	-1.341, bs	0.747	1.232*	0.546	1.640*	0.644	-1.39	0.8574	0.207	0.337
Lawyer	0.175	0.751	no obs.	no obs.	no obs.	no obs.	no obs.	no obs.	0.388	0.743
CR manager	no obs.	no obs.	2.458*	1.020	no obs.	no obs.	0.883	1.123	0.85	0.743
In an internship	0.48	1.04	no obs.	no obs	4.138***	1.040	no obs.	no obs.	2.388***	0.738

5.4 The effect of firm framing on behavior trends, consistency and heuristics

Behavior trends We identified individual trends of contributions and group trends of contributions by defining by an increasing trend a strict increase of at least 1.7\$ and a decreasing trend a strict decrease of at least 1.7\$. Out of 24 participants in the intrafirm treatment for Firm 1, 8 displayed an upward trend, 3 displayed a downward trend and 13 did not display any upward or downward trends. 3 contributed 10 in all rounds, which represents 12.5% of the Firm 1 sample and 10.7% of the overall intra-firms treatment. In the inter-firms treatment, the trends were respectively for 32 participants, 9 displayed an upward trend, 10 displayed a downward trend and 13 did not display any upward trends or downward trends. Out of 28 participants in the neutral information treatment, the trends were respectively 4, 3 and 21. 2 subjects contributed 10 at all rounds, representing 7.1% of the sample. Table 5 shows the proportion of the upward trends and downward trends of individual contributions per treatment. It shows the impact of firm affiliation on individuals' trends of contributions. The intra-firm treatments and the inter-firms treatments had a greater proportion of the players who choose to increase their contributions to the group account. These results show that the boundaries of the firm have an impact on individual behavior and that players are more inclined to cooperate when being informed that they are affiliated with players who are part of their own firm.

A greater proportion of distinct individual trends of contributions is observed in the firm treatments. This means that the information given about firm affiliation helps individuals build and implement intentions. Upward trends of contributions are observed in the intrafirm treatment in Firm 1 and Firm 2 and in the intra-corporate group treatment. The greatest proportion of the downward trends of contributions is observed in the intra-corporate group treatment. The proportion of the upward trends and downward trends of group contributions per treatment. The results found in the for individual trends hold for group trends. A greater proportion of distinct group trends of contributions is observed in the firms treatments. Upward group trends of contributions are observed in the intrafirm treatments and in the intra-corporate group treatments.

Table 5: Trends in individual and group contributions, in percentages

Treatment	Individual trends		Group trends	
	upward	downward	upward	downward
Neutral information	14.3	11	0	0
Intra-corporate group	28.1	31.5	25	25
Intrafirms	28.1	9.3	50	0
Intrafirm Firm 1	33.5	12.5	33	0
Intrafirm Firm 2	8.5	0	50	0

RESULT 3: *A greater proportion of distinct individual trends of contributions and of distinct group trends of cooperation are observed in the intrafirm treatment and in the intra-corporate group treatments.*

Behavior consistency We measure behavior consistency by reporting individuals’ propensity not to deviate from individual trends. Cooperative behaviors in public good games correspond to high levels and continuity of individuals’ contributions to the public exchange. Standard results display high rates of contributions in the first rounds of the game followed by a decrease in the following rounds. This decline signals that individuals revise their strategy by keeping their endowment instead of contributing to the public good game. In order to measure individual’s propensity to stick to their initial strategies, we regress individuals’ actual contributions on a linear function representing their trends. This generates an estimate of individuation deviation from individual trends and identifies the magnitude of individual deviations from trends per treatment. We find that the mean residuals of individual contributions on individual trends, per treatment, display higher consistency in the firm treatments. Individual mean deviation from trends in the intrafirm treatment and in the intra-corporate group is of 1.92 and of 2.24 in the baseline. Individual deviation from trends in the intrafirm treatment for Firm 1 differ greatly from the results for Firm 2. The magnitude of the deviation from trends for Firm 1 is low (1.66) and it is high in the case of Firm 2 (2.7). We find that individuals in the baseline deviate more from their trends than subjects in the two other treatments. The results in the intrafirm for Firm 1 display high level of consistency. They are followed by the results in the intra-corporate group treatments. Table 6 shows the the mean residuals of individual contributions on individual trends, per treatment.

Table 6: Individual deviation from individual trends per treatment

Treatments	Neutral information	Intra-corporate group	Intrafirms	Intrafirm Firm 1	Intrafirm Firm 2
Deviation	2.24	1.92	1.92	1.66	2.7

RESULT 4: *The greatest proportion of consistent behaviors is observed in the intrafirm for Firm 1 and in the intra-corporate treatment treatments.*

Prescriptions and additional justifications We report information about individual prescriptions that subjects gave in the post-experiment questionnaire. Responses were coded according to a comprehensive typology, reflecting the range of responses that were given by the participants. Multiple responses per subject are reported for the additional concerns but types of behavioral prescriptions and responses in

terms of decisions taken in the experiment are exclusive in each category. However, the relative intensities of the responses have not been coded because of likely interpretation errors. Responses are reported in the Table 7 and Table 8. The subjects' prescriptions were reported at the end of the experiment. They were classified according to the following categories: "investment", "contribute half", "adaptative" and "low contributions". The "investment" category refers to answers such as "All put 10", or "Invest the maximum". The "contribute half" prescription refers to answers which describe a preference for a division between the group exchange and the individual exchange, such as answers like "50/50.". The "adaptative" strategy refers to answers such as "By taking into account the actions of the other participants"¹² Subjects in treatments in which social distance was higher provided longer and more diverse explanations of their behavior in the game. Subjects in the intrafirm Firm 1 reported answers of 10 words, in the intrafirm Firm 2 answers of about 5 words, in the intra corporate group subjects reported answers averaging 12 words, and in the neutral information, subjects reported answers of averaging 19 words.

The effect of treatments on the coherency between conduct and prescriptions First, we find that individuals' main prescriptions in the experiment are as follows. About 70% of the subjects who responded to the questionnaire in the Intrafirm treatment for firm 1 say that they think that everybody should invest all the endowment in the group account. The percentage is about 55% and below in the other treatments. The prescription to keep all of the endowment was reported only in the neutral information treatment. In the intrafirm treatments, 14% responded that they should divide their endowment while 23% and 28% responded so in the neutral information and intra-corporate groups. About 15% in all treatments responded that they thought that subjects should adapt to the behaviors of others in the experiment. Second, we find that about 40% of the subjects in all treatments reported that they contributed. The percentage of individuals reporting that they kept all their endowment is about 10% in all treatments, and is slightly below in the case of the intrafirm Firm 1. No subject in the intrafirm treatments reported that they divided their endowment. About 20% of the subjects reported in the intrafirm Firm 1 that they adapted their behaviors to others. The striking result of the explanation is that 40% of individuals report that wanted to foster cooperation with their contributions. Also in the neutral information treatment, a greater share of the subjects report that they want to keep money for their own consumption or that they want to balance their own consumption with the revenue of the group. The results with regards additional justifications are striking. The greatest share of additional justifications are obtained in the neutral information treatment, followed by the intra-corporate group treatment. Some important

¹²"En prenant en compte les actions des autres participants".

justifications are added by the subjects. About 30% mention their concern for the community it in the intrafirm Firm 1 and Firm 2. Also a greater part of the subjects in those treatments reported (a) they increased their contributions, (b) investing 2/3 of their endowment and (c) investing at the end of the game. In the neutral information treatment, the striking result is that a larger part of the individuals reported trying several techniques and some subjects explained that they had an end-game strategy to reduce their endowment.

RESULT 5: *Heuristics in the intrafirm treatments are simple and there is a greater variety of explanations and of justifications when social distance is high.*

Table 7: Main prescriptions, formulation of decisions and explanations per treatment, in percentages

Treatment		Intrafirm	Intrafirm	Intra-corporate	Neutral
		Firm 1	Firm 2	group	information
Main prescriptions	Invest all	68	43	52	54
	Keep all	0	0	0	8
	Divide	14	14	28	23
	Adapt	18	14	12	12
Main actions	Investment	36	0	44	42
	Low contributions	5	14	12	12
	Divide	0	0	16	23
	Adapt	23	14	12	15
Main explanations	To push for cooperation	41	0	44	50
	Own consumption to increase revenue	9	0	12	12
	Balance own consumption and group revenue	9	14	24	15
	Take into account other's decisions	23	0	24	15

5.5 Using the boundaries of the firm to capture and describe cooperative types and cooperative intentions in the firm

The use of cooperative types and of their distribution in voluntary contribution mechanism experiments to specify strategies cannot be qualified as a systematic research strategy in the study of behaviors in voluntary contribution mechanism experiments. Most classifications are contribution-based. It is important to note that any classification is arbitrary to some degree. Classification procedures are useful to organize and understanding the experiment results. It is also important to participate in the effort of building a map, a data-base, of the distributions of types of behaviors that can be found in the myriad of contexts in which economic phenomena which are similar to the form of the voluntary contribution mechanism present themselves. In our view, they are useful to compare results from the lab with results from the field.

Table 8: Additional prescriptions, formulation of decisions and explanations per treatment, in percentages

Treatment		Intrafirm Firm 1	Intrafirm Firm 2	Intra-corporate group	Neutral information
Additional prescriptions	Invest 2/3	0	0	8	4
	Randomness	5	0	0	4
	Trust	0	0	8	8
	Equity/equality	0	0	0	8
	Prudence	0	14	0	0
	Nastiness	0	0	0	8
	Community	27	29	16	19
Additional actions	Increasing	23	0	12	19
	Decreasing	0	0	8	8
	Keep 1/3	14	0	0	12
	Several techniques	14	29	8	35
	End game strategy	0	0	20	8
	Invest in order to free ride	5	0	0	12
	Prudence/Caution	0	0	8	8
	Equity	0	0	0	4
	Chance	5	29	0	0
Additional explanations	Random	5	29	0	0
	Invested at the end	9	0	0	0
	Prudence	9	0	16	0
	End-game	0	0	24	12
	Evolution in strategy	5	0	4	4
	No explanation	18	71	8	23

The 30% cut-off at Round 1 The conventional manner to present types of cooperative behaviors is to divide subjects into two main types: "free-riders" and "cooperators". Isaac and Walker (1988a) first propose to use the first round of the repeated game to classify subjects' behaviors. They proposed a cut-off at 33 percent: any subject contributing less would be a *free-rider* and any subject contributing more would be a *cooperator*. Gunnthorsdottir et al. (2007) use a similar methodology but they use a cut-off at 30 percent of the endowment. The classification relies on the following procedure. If a subject's first-round contribution to the public good is 30 percent or less of his/her endowment in the first round, we type-classify him/her as a "free-rider". If a subject's first-round contribution to the public good is more than 30 percent of his/her endowment in the first round, then he/she is a "cooperator". It is important to underline that in Gunnthorsdottir et al. (2007) classification, a subject is classified only once. This classification does not change throughout the course of the experiment. They find that their classification is robust both with regard to the cut-off point that they chose and also with regard to the number of types they consider. For instance, they argue that adding a third type called "strong-cooperators" would lead conclusions similar to the ones they identify.

The typical results of voluntary contribution mechanism with no communication and no punishment

opportunities are appropriately captured by Gunnthorsdottir et al. (2007)'s classification of subjects as free-riders or as cooperators based on their initial contributions to the experiment. Graphical representations of the results of Gunnthorsdottir et al. (2007) portray the typical decrease in cooperation that is observed in public good experiments. When the marginal per capita return is equal to 0.3, the average contributions of free-riders start just below 20% of the endowment and the average contributions of cooperators start at about 70% of their endowment. At round 5, both average contributions are around 20% and they decline to close to 0%. When the marginal per capita return is equal to 0.5, the starting values of the contributions are similar to the treatment with a marginal per capita return at 0.3, but the decline in contributions are slower. At round 5, the cooperators provide the group account on average with 50% of their endowment and at round 10, they provide it with 40% of their endowment. They find that almost all the decrease in cooperation can be attributed to reductions in cooperators' contributions. In treatments in which the frequency of interactions between cooperators and free-riders is low, they observe slower rates of decrease in contributions.

By using the procedure of Gunnthorsdottir et al. (2007), we describe the results of our experiments in Table 9. We observe that the percentage of "free-riders" is greater in the firm treatments. We observe that the percentage of free-riders is the highest in the intrafirm treatment for Firm 2, followed by the intrafirm treatment for Firm 1. The percentage of cooperators is the highest in the intra-corporate group treatment, followed closely by the neutral information treatment. In the case of the neutral information treatment, they display that the mean contributions of free-riders start at 2 and reach 6\$ at round 4, while the contributions of cooperators start at 6\$, increase, and then decrease. From round 4 until round 10, the mean contributions of the cooperators and the free-riders converge to the same levels, with negligible variations. In the intra-corporate group, free-riders start at 2\$ and reach 5\$ at round 5. The mean levels of contributions then vary until an end-game effect at round 10. Mean contributions of cooperators start at about 6\$, increase and then decline to a sustained level of 6\$. In the intrafirm treatment for Firm 1, the mean contributions of free-riders start below 1\$ and remain below 5 throughout the experiment, with a slight end-game effect. The mean contributions of cooperators start above 7\$ and increase up to 9\$. There is an increase from round 9 to round 10. These results do not match the results of Gunnthorsdottir et al. (2007), who find that behavior types are sustained over time. In the case of the neutral information treatment, the two types converge after 4 rounds. In the case of the intra-corporate group, the two types converge at round 9. The last round is characterized by a pronounced end-game effect in the case of the free-riders and by sustained cooperation by cooperators. The intrafirm treatment for Firm 1 shows

that the mean contribution levels of cooperators and free-riders do not converge. The contributions of cooperators increase and those of free-riders remain relatively stable but at lower levels of contributions. With the exception of the neutral information treatment in which the two types converge very quickly and then remain alike, the conventional cooperator/free-riders distinction seems appropriate to distinguish the two main types of contributors in the experiment.

Result 6: Apart from the neutral information treatment in which mean contributions of cooperators and free-riders converge rapidly, the conventional cooperator/free-riders classification identifies two types of cooperative types which are consistent throughout the experiment.

The most robust findings in voluntary contribution mechanism experiment with no communication and punishment opportunities is certainly that contribution levels drop over time and that cooperation levels diminish. The evidence is that the Gunnthorsdottir et al. (2007) classification of cooperative types is very relevant to describing their data, which is consistent with the main findings in the literature on voluntary contribution mechanism. Our results display features which are consistent with those of Charness and Villeval (2009). Apart from the baseline, in which a slow but persistent decline is observed, the other treatments do not display this typical pattern of cooperation. For instance, there is no end-game effect in the intrafirm treatments. Our results are coherent as the findings of Branas-Garza and Espinosa (2008), who elicit the confusion of subjects with regards beliefs on the occurrence of end-game effects at the end of a series of rounds in voluntary contribution mechanism experiments. Accounting for these variations in cooperative behavior, we propose to use different "cooperator"/"free-riders" cut-offs. We observe that the "free-riders" – "cooperators" classification based on a cut-off in the first round of the experiment is not an appropriate strategy in the context of our data. We propose to use contributions in the last round in the experiment to classify "free-riders" and "cooperators". This strategy accounts for the fact that most cooperative strategies in the experiment are increasing. It also accounts for the fact that cooperation can be seen through its result, captured in the experiment through the levels of contributions at the end of the game. The results of the cut-off at 70% and the results of the cut-off at 90% is depicted at in Figure 5.5.

The 70% cut-off at round 10 We find that the 70% cut-off provides a valuable picture of the different types of cooperative types in the data, as it depicts how the contributions of free-riders and those of cooperators diverge. In the neutral information treatment, the mean contributions of both types which represent 50% of the population each start at the same level and then separate. With the exception of

round 5 in which both types converge, the difference between both types is steady and characterized by a severe negative end-game effect in the case of the free-riders and by a positive end-game effect in the case of the cooperators. Overall, the trends in behavior of all individuals in the neutral information treatment are relatively homogenous, with the exception of the end-game effect. Results in the intra-corporate group show that 37.5% of the subjects substantially increase their contributions towards the end of the game, while the rest substantially decrease their contributions in the last round. From round 2 to round 8, the mean contributions of the groups are similar. The case of the intrafirm for Firm 1 treatment differs considerably from the two previous treatments. The 70% cut-off distinguishes two groups of contributors. 58.33% of the subjects are composed of individuals who start their contributions above 5 and then increase their contributions. The rest of the subjects, 41.67% decrease their contributions after round 5. From round 6 to 8, the difference in contribution levels is about 5\$, which is considerable, in comparison to the other treatments.

The 90% cut-off at round 10 We find that the 90% cut-off is a complementary source of information to the 70% cut-off. In the case of the neutral information treatment, it shows cooperators' efforts to pull cooperation by providing the group account with contributions of 9\$ on average in round 3 and consequent decrease. Results in the intra-corporate group differ from the results depicted with the 70% cut-off. We find that 28.13% of the subjects contribute about 10\$ throughout the experiment and that all the decay in cooperation can be attributed to the rest of the subjects. The results are consistent with Camerer and Fehr (2006) who find that a minority of other-regarding individuals can generate a "cooperative" aggregate outcome if their behavior generates incentives for a majority of self-regarding people to behave cooperatively. The 90% cut-off helps identifying a fundamental feature of the results in the intrafirm treatment for Firm 1, which is the persistence of the gap between cooperators and free-riders throughout the experiment. The classification based on the cut-off at 90% in the last round allows a division of both types of subjects which corresponds to almost half the population. This provides a more accurate description of the overall behavior in the pool than the one provided by the 70% cut-off based on the first round.

Result 7: *Cooperators do decline their contributions.*

The role of cooperative leaders and of cooperative intentions in the firm Results in the intrafirm Firm 1 and in the intra-corporate group differ in the two other treatments with regard to

Table 9: Distribution of cooperative types in percentages

Treatment	R1 (at 30%)		R10 (at 70%)		R10 (at 90%)	
	Free-riders	Cooperators	Free-riders	Cooperators	Free-riders	Cooperators
Neutral information	35.71	64.29	50.00	50.00	64.29	35.71
Intra corporate group	34.38	65.63	62.50	37.50	71.88	28.13
Intrafirm Firm 1	58.33	41.67	41.67	58.33	54.17	45.83
Intrafirm Firm 2	100.00	0	75.00	25.00	87.50	12.50

the proportion of conditional cooperators. Conditional cooperators are subjects whose contributions are positively correlated with the expected contribution of others and whose behavior are not consistent with the free-riding hypothesis. Conditional on further experimental tests, the results suggest that the classification of conditional cooperators (Fischbacher et al., 2001) may not be complemented by a category of "cooperative leaders". "Cooperative leaders" may differ from strong cooperators, as their intention is to foster cooperation - if the intention is identifiable in the data. For instance, in the case of the intrafirm treatment for Firm 1, we observe that (a) about half the subjects in the pool remain below the contributions of the the other half and that (b) this did not impact the level of contributions of the other half. Results from the post experiment questionnaire allow an interpretation of the result, conditional on further experimental validation. The subjects who reported in the investment prescription invested on average 66.2\$ in the group account, which is higher than the mean of the group (60.5\$) and higher than the contributions of those who did not report the investment prescription (48.28\$). We use their classification and add a category "cooperative leaders"¹³ to identify the types of cooperative behaviors of subjects across treatments. We report the results in Table 10.

This suggests that subjects in the firm environment reporting an investment prescription were less sensitive to the level of contributions of other members of their group. Many reports they wanted to push cooperation with their contributions in the post experiment questionnaire answers. Some subjects explicitly said that they contributed "So the team may do the same as the experiment goes on and to increase our revenue"¹⁴ or "Because if everybody makes the same decision as mine, I will earn more. And even if at the beginning the other participants invest less, they can see how much I invest and they are more likely to understand that we have to invest the maximum to earn more."¹⁵ Some subjects reported they wanted to establish cooperation: "In the first round I put only one token in order to study the

¹³Note that "cooperative leaders" can also be described as strong cooperators. However, in the context of the firm the term "cooperative leaders" depicts the role of cooperative intentions of these subjects.

¹⁴"Pour que l'équipe au fur et à mesure fasse de même et pour faire fructifier notre budget."

¹⁵"Car si tout le monde prend la même décision que moi, je gagnerais plus. Et même si au début les autres participants misent moins, il voient combien je mise et ont plus de chance de comprendre qu'il faut miser le maximum pour gagner plus."

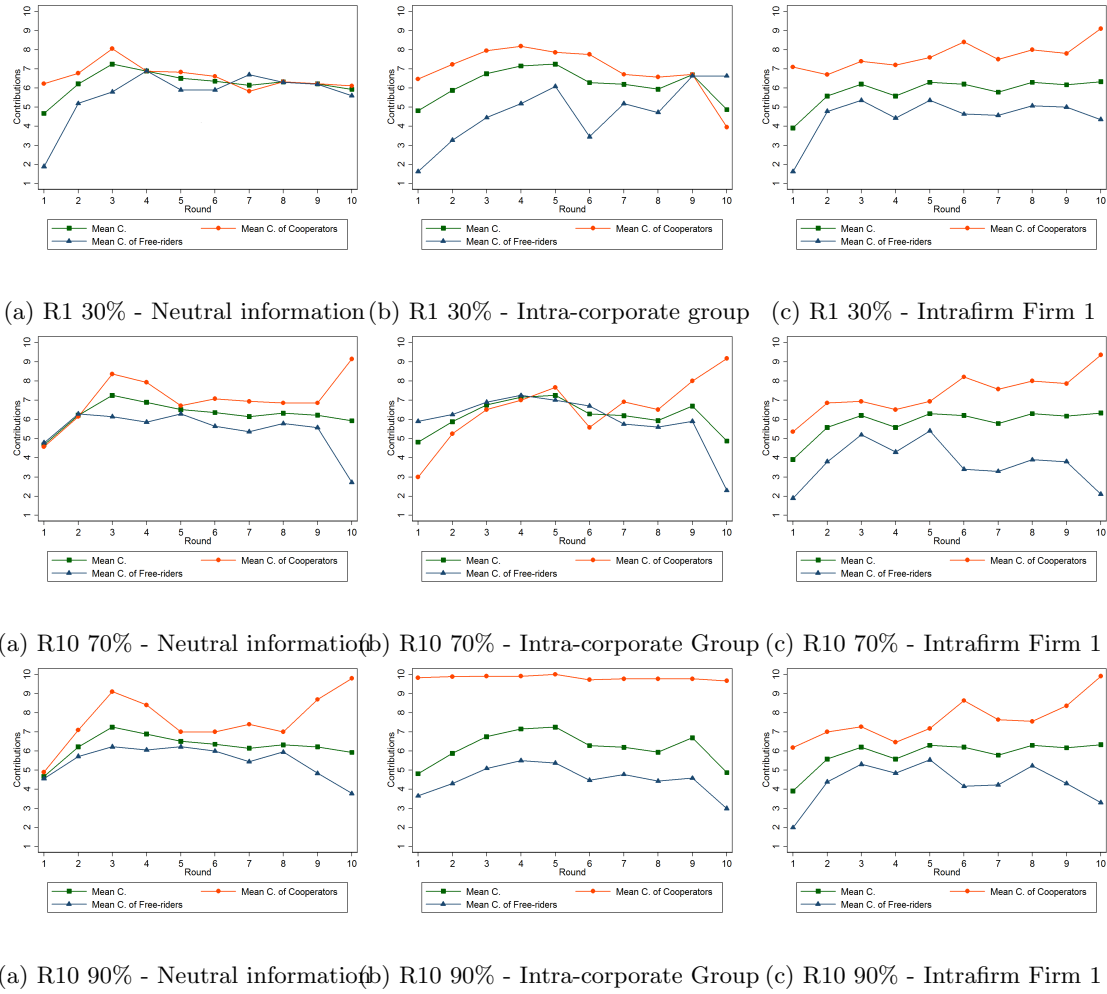


Figure 3: Free-riders/cooperator classification with different cut-off

behavior of my team. When I saw that they were putting more, I increased my contribution but never above 6 tokens”.¹⁶ Another reported: ”I invested 5, the first time in order to evaluate my co-participants... then 10 at each round to boot my team... thus 95 in total”¹⁷ These strategies to foster and establish cooperation can be conceived as specific forms of identification which allow individuals to individuate through cooperative decisions.

Result 8: *The greatest proportion of cooperative leaders is in the intrafirm treatment for Firm*

1.

¹⁶”Au premier round, je n’ai misé que 1 token pour étudier en premier le comportement de mon équipe. Lorsque j’ai vu qu’ils pariaient plus gros, j’ai augmenté la mise mais sans jamais dépasser 6 tokens.”

¹⁷”J’ai misé 5, la première fois pour évaluer mes co-participants.... puis toujours 10 pour booster mon équipe.... soit 95 au total....”.

	Conditional	Hump-cooperators	Free-shaped riders	Other patters	Cooperative leaders
Neutral information	42.86	14.29	3.57	25.00	17.86
Intra-corporate group	62.50	15.63	3.13	9.38	9.38
Intrafirm Firm 1	58.33	12.50	4.17	4.17	20.83
Intrafirm Firm 2	37.50	37.50	12.50	12.50	0.00

Table 10: Classification per treatment in percentage

5.6 The effect of firm boundaries on the weight given to identity and its effect on cooperation

The model implies that if $x_i < S$, and if the weight given to identity increases from one round to the next, then optimal consumption decreases. On the contrary, if the weight given to identity decreases, then optimal consumption increases, resulting in a decrease of cooperation among players of the voluntary contribution mechanism game. Through change the weight that they give to identity, the level of contribution can change. This feature of the formulation makes the weight given to identity a constitutive part of the process of engaging in cooperation. It accounts for the fact that the firm may produce identification by allowing individuals to change their perception of themselves through engaging in cooperative effort.

$$\left\{ \begin{array}{l} \text{if } \alpha \text{ increases, then } x_i \text{ decreases} \\ \text{if } \alpha \text{ decreases, then } x_i \text{ increases.} \end{array} \right.$$

We provide an approximation of the evolution of the weight given to identity by using decisions in the game and answers to the questionnaire. We provide two estimates of \tilde{I} . First, we approximate it by using the overall weight given to identity in the Aspects of Identity Questionnaire¹⁸. Second, we approximate it by $\tilde{I} = \frac{S}{2}$ as in Aguiar et al. (2010). The results of the estimation are reported in the Table 5.6. Columns $\alpha (x_{ii} \text{ R1}; p_{ii} \text{ R1})$ serve as a benchmark to the other approximation $\alpha (x_{ii} \text{ R10}; p_{ii} \text{ R10})$. Columns $\alpha (x_{ii} \text{ R1}; p_{ii} \text{ R1})$ measure the weight given to identity given the assumption that $x_i = p_{ii}$. Column $\alpha (x_{ii} \text{ R10}; p_{ii} \text{ R10})$ define the weight given to identity as regards consumption in the last round. For this approximation, we use the prescriptions as given in the post-experiment questionnaire. Our motivation for this procedure is the following.

The collective aspects of prescriptions As we account for the fact that prescriptions are influenced by collective intentions, which are formed during the experiment, we asked subjects to explain how they think participants should play the game. This also allows to identify the actual prescriptions of the subjects as regards the collective aspect of the decision. Thus, it is important to note that concerning

¹⁸We divide the AOI by 10 to avoid differences in results due to differences in numerical variations across both estimate.

the formation of prescriptions, our strategy accounts for the fact that the game is repeated¹⁹. First, we report approximations of \tilde{I} with the overall Aspects of Identity index per subject. With this valuation of \tilde{I} , we find that the weight given to identity decreases in the neutral information treatment and in the intra-corporate group treatment. In the latter, the decrease is less prominent. We find that the weight given to identity increases or is stable in the intrafirm Firm 1 treatment. With the AOI approximation of \tilde{I} calculated as AOI/10, the decline is not severe in the intrafirm Firm 2 treatment. In the first round, standard deviations are all low (given $x_{ii} = p_{ii}$) in the approximations of the weight given to identity for the decisions. In the last round, they all increase. The results hold with the second approximation of the level of \tilde{I} , which replicates the estimate of Aguiar et al. (2010). We inquire into the determinants of the weight given to identity by using the approximation of α with x_{ii} in Round 10 and p_{ii} in Round 10. The results show that some socio-demographic variables affect the weight given to identity, but the determinants do not explain little in the variation ($R^2 < 0.08$).

Result 9: *Individuals' effort to live up to their prescriptions is higher in the intrafirm treatment for Firm 1 than in the other treatments.*

Effect of the weight given to identity on contributions We report in Table 5.6 the effect of weight given to identity. In the neutral information treatment, the results show that the weight given to identity does not affect contributions. In the intra-corporate group and in the intrafirm Firm 1, weight given to identity affects the contributions positively. No significant result is found in the intrafirm treatment Firm 2.

Result 10: *Individuals' weight given to identity affects contributions positively in the intrafirm treatment for Firm 1.*

6 Conclusion

This article suggests that the description of intrafirm cooperation should be complemented by a concern for the effect of "identity boundaries", consistent with Eisenhardt and Santos (2005). The role of social distance between individuals in the organization should be central in this inquiry. The results of the study suggest to reevaluate the role of identity boundaries in the firm as well as the role of the firm in encouraging cooperation. The experiment shows that manipulating individuals' sense of affiliation to the firm has an

¹⁹Aguiar et al. (2010) study a one-shot decision in which prescriptions are not influenced by decisions of others.

Table 11: Weight given to identity per treatment (with two approximations of \tilde{I})

Treatments	The AOI estimate of I		The Aguiar et al. (2010) estimate of I	
	$\alpha (x_{ii} \text{ R1}; p_{ii} \text{ R1})$	$\alpha (x_{ii} \text{ R10}; p_{ii} \text{ R10})$	$\alpha (x_{ii} \text{ R1}; p_{ii} \text{ R1})$	$\alpha (x_{ii} \text{ R10}; p_{ii} \text{ R10})$
Neutral information	0.717	0.374	0.621	0.051
(st. dev.)	0.176	0.443	0.224	0.690
Intra-corporate group	0.670	0.459	0.566	0.090
(st. dev.)	0.179	0.442	0.230	0.792
Intrafirm Firm 1	0.626	0.675	0.528	0.495
(st. dev.)	0.194	0.405	0.241	0.645
Intrafirm Firm 2	0.498	0.453	0.369	0.114
(st. dev.)	0.033	0.389	0.015	0.601

Table 12: Determinant of α (with two approximations of \tilde{I} and with $\alpha (x_{ii} \text{ R10 } p_{ii} \text{ R10})$)

	The AOI approximation			The Aguiar et al. (2010) approximation		
	Coeff.	Std. err.	R^2	Coeff.	Std. err.	R^2
Project manager	-0.3037	0.1604	0.044	-0.547	0.262	0.053
(p-values)	0.06			0.04		
Director				-0.339	0.193	0.037
(p-values)				0.08		
Tenure 2 years	0.25	0.146	0.036	0.425	0.239	0.039
(p-values)	0.09			0.079		
Tenure 3 years	0.268	0.152	0.038			
(p-values)	0.083					
Tenure 5 years	-0.323	0.138	0.066	-0.5794	0.225	0.07
(p-values)	0.022			0.012		
Age 25 - 34	0.205	0.096	0.05	0.327	0.157	0.052
(p-values)	0.03			0.041		
Age below 25	-0.199	0.108	0.04	-0.299	0.177	0.035
(p-values)	0.06			0.096		
2 years of Higher Education	0.252	0.11	0.063	0.472	0.178	0.082
(p-values)	0.025			0.01		
Education University Master	-0.212	0.12	0.038	-0.394	0.196	0.048
(p-values)	0.082			0.049		

Table 13: Effect of the weight given to identity on total contributions per treatment (with two approximations of \tilde{I} and x_{ii} at R10 and p_{ii} at R10; DV: total contributions)

Treatments	IV	Coeff.	St. Err.	R^2
Neutral information	The AOI approximation	-6.759162	8.586	0.025
	(p-values)	0.43		
	The Aguiar et al. (2010) approximation	-4.972	5.486	0.033
	(p-values)	0.374		
Intra-corporate group	The AOI approximation I	6.295	10.688	0.014
	(p-values)	0.56		
	The Aguiar et al. (2010) approximation	3.849	5.952	0.017
	(p-values)	0.524		
Intrafirm Firm 1	The AOI approximation I	41.541	9.855	0.47
	(p-values)	0.00		
	The Aguiar et al. (2010) approximation	25.332	6.341	0.443
	(p-values)	0.001		
Intrafirm Firm 2	The AOI approximation I	17.365	18.616	0.178
	(p-values)	0.404		
	The Aguiar et al. (2010) approximation	6.528	10.733	0.569
	(p-values)	0.57		

impact on cooperation, as increasing social distance is associated with declining cooperation. This study is seminal in providing experimental evidence that intrafirm environments positively affect interindividual cooperation. Understanding the effect of firm boundaries on behavior inside firms is certainly a complex task, but its importance is considerable for the study of intrafirm behavior. This paper provides seminal and unique evidence from the field that firm boundaries affect workers' behavior and that they have a positive impact on cooperation. The main results which in our view validate the second hypothesis are that contributions decline when social distance is high, which is consistent with standard results, and the fact that prescriptions and behavior coherence are negatively affected by higher social distance among subjects. The greatest proportion of consistent behaviors is observed when social distance is low whereas high social distance is associated with noisier decision-making processes. The experiment shows that individuals embrace different strategies depending on the characterization of the group they are in and on the information they are provided during the experiment.

As regards the level of cooperation and the types of cooperators that are found in the pool of subjects, the results of the experiments are consistent with the overall evolution of the consensus in the literature on cooperation in voluntary contributions mechanism experiments. As noted by Hodgson (2012), more recent surveys (Ostrom, 1998; Holt and Laury, 2008) conclude that levels and trends of contributions vary across populations and contexts, but that the consistent results show there is a deviation from the Nash equilibrium. The main results which validate our hypotheses is to be found in the fact that, without

contributions or without punishment, contributions to the public good account do not decline in the intrafirm experiments. As shown by the results of Charness and Villeval (2009), the results generated by our experiment fundamentally question our understanding and challenge our knowledge of cooperative patterns of behavior in economics. The major findings lie in the fact that the use of simple heuristics in the intrafirm treatments can be observed. Subjects in the intrafirm treatments are mainly concerned with investing in the group account and do not develop complicated justifications of their behavior. We also identify the role of cooperative leaders in establishing cooperation, and find that being a cooperative leader is a strategy which allows individuals to develop specific identification strategies that can be described as individuation strategies. We contribute to the knowledge on cooperation through the debate on explanations of cooperation. We find that there are generalized forms of reciprocity and that these views compete with specific explanations of cooperation (Ben-Ner et al., 2004). This suggests we should go further in the identification of the evolutionary roots of reciprocal behavior (Guth and Yaari, 1992; Gintis, 2000), as it may help provide an explanation of cooperation taking into account its conditions of emergence (Ben-Ner et al., 2004). As regards the study of organizations in economics, our empirical research shows that organizational phenomena are better understood if cognition and motivation are allowed to interact in the theory of the firm (Foss, 2004), notably through the concept of identity.

As regards the behavioral aspects of the theory of the firm, this paper shows that factors responsible for establishing cooperation inside and outside the firm differ. By doing so, it nourishes the debate on one of the seminal tensions which structure the analysis of intra-firm cooperation in the economics of the firm, namely the contradiction between the firm-market continuum hypothesis and the concern for the role of the 'atmosphere', which remains underdeveloped in the analysis of the firm in economics (Eisenhardt and Santos, 2005). The results advocate a characterization of the features of the different environments in which individuals make economic decisions and take actions. This chapter shows that, inside the firm, and at least when facing simple decisions like linear public good games, behaviors differ from standard predictions and may be more predictable than previously assumed. This experimental study, which helps identify patterns and biases of behavior in the firm, aims at explaining how human motivation may be analyzed through the desire to structure the world in ways that reduce the uncertainty of an individual's actions and those of others, as suggested by Heiner (1983). The results in this chapter contradict the firm-market continuum hypothesis by showing that firms frame cooperative patterns of behavior. This chapter provides empirical evidence that the firm is a "social community" which has a normative function in creating and transferring knowledge (Kogut and Zander, 1996) and that the nature of the firm is

precisely to enforce cooperation (Hodgson, 1996).

Evidence supports an analysis of cooperation which incorporates the features of the firm in which individuals are. An analysis of cooperative behaviors in different economic contexts implies a reflection on those contexts and on their framing effects, which is one of the main aims of field experiments in economics (Harrison and List, 2004). Indeed, in most of transaction-costs economics, humans are portrayed as "self-interested seeking with guile (which) includes ... more blatant forms, such as lying, stealing and cheating ... (but) more often involves forms of deceit" (Williamson, 1985). On this issue, the results provided by this paper are coherent with Fehr and Gächter (2000)'s concerns for the necessity to include reciprocity in the description of individual motivations inside organizations. In addition to this concern, this work illustrates the utility of documenting the specificity of intrafirm behavior with economics methodologies as this strategy allows the comparison with current economics empirical research. This study suggests that the effect of other organizational set up and of different degrees of cohesion on cooperative patterns in the firm have to be identified. With regards to the effect of firm boundaries on behavior, the research agenda set by management scholars may serve as a guideline for future research (Eisenhardt and Santos, 2005). To this end, the complex underlying motivations of individuals when constructing cooperation in intrafirm environments and the reasons that may negatively affect this construction shall be thoroughly documented. However, this future research will require field and laboratory research, as the latter, in our view, are complementary to field experiments in the study of organizational behavior.

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