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Investigating the Ability of Pro-social Emotions to Enhance Cooperative Behavior

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INVESTIGATING THE ABILITY OF PRO-SOCIAL EMOTIONS TO ENHANCE COOPERATIVE BEHAVIOR

A Thesis Presented

by

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DEDICATION

This thesis has being a long journey for me and my family, and finally it is complete. I want to dedicate this work to my husband César and my son Matías, who always bring me their love, support and confidence in all the steps of this process. Also, I need to say “thank you” to my family in Chile. My mother Lucía, my father Vicente, my brother Leonardo and my grandmother Guillermina were always looking after me, no matter the distance between us.

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ABSTRACT

INVESTIGATING THE ABILITY OF PRO-SOCIAL EMOTIONS TO ENHANCE COOPERATIVE BEHAVIOR

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This research investigates the use of pro-social emotions to improve cooperation. In particular, it tries to reconcile the results from Noussair and Tucker (2007) and Lopez et al. (2010) by exploring whether shame, as a pro-social emotion to enhance cooperation, can be triggered by changing the number of individuals who have their decisions revealed to their group. In order to reach this goal the design of the experiment considers different degrees of revelation, which range from no revelation (anonymity) to partial and full disclosure of information. Additionally, I use different microeconometric specifications to accommodate different hypothesis about the motivation of the subjects behind their decisions.

My results diverge from those of Lopez et al. because I find that revealing the decision of a single subject at random does not significantly increase cooperative behavior, which is the main result of these authors. Also, my findings indicate that cooperation is triggered only when I reveal information of either 3 or all the subjects in the group, the last case being similar to the public observability of Noussair and Tucker. These authors find a non-permanent increase in contributions, so I do but using a positive framed-experiment with disclosure of additional information, the group's earning loss. Therefore, random revelation together with the disclosure of information about some subjects' decisions appears to be a good alternative to promote

cooperation when revelation of all the subject's decisions is not viable. Furthermore, this mechanism proves to be efficient in a sample pool of undergraduate students. Also, I observe the reduction in contributions over time that is observed by other authors. However in the random treatments, particularly in random revelation, contributions decay by less than 40% between the first and the last period.

The most interesting result that I obtain from the different microeconometric specifications used in this research is the evidence of altruism and positive reciprocity in the specification of Ashley et al. (2003, 2010), instead of the expected matching in contributions reported by these authors.

Keywords: Experimental economics, voluntary contributions mechanism, public goods, laboratory experiment.

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CHAPTER 1

INTRODUCTION

1.1 Research Problem

One of the fundamental puzzles in experimental economics is how to improve the level of cooperation in linear public good games. However, there is a stylized fact that is common to several Voluntary Contribution Mechanism (VCM) experiments: “In repeated-round settings, average contributions start in the same range (40-60% of endowment), but decline over rounds and remain significantly different from zero in the last round” (Ferraro and Vossler, 2010, pp.1). No matter the mechanism proposed to enhance cooperation [monetary and non-monetary punishment (Fehr and Gachter, 2000; Masclet et al., 2003; Bochet et al., 2006; Nikiforakis and Normann, 2008); communication (Isaac et al., 1985; Cason and Khan, 1999; Kinukawa et al., 2000; Bochet et al., 2006; Bochet and Putterman, 2009); or monitoring or observability (Croson and Marks, 1998; Andreoni and Petrie, 2004; Berlemann et al., 2004; Noussair and Tucker, 2007; Lopez et al., 2010), etc.] the result is almost always significant positive contributions in the firsts periods under analysis, but this effect decreases towards zero at the end of the game.

In this context, I investigate the use of pro-social emotions or behaviors to improve cooperation. “An emotion is *pro-social* if it induces an agent to act in ways that increase the average payoff to other members of a group to which the agent belongs. Among the pro-social emotions are *shame*, *guilt*, *empathy*, and *remorse*, all of which involve feelings of discomfort at doing something that appears wrong according to one’s own values and/or those of other agents whose opinions one values” (Bowles and Gintis, 2003). This type of mechanism has been used by several authors, but with different results. Barr (2001) develops a framed field experiment in Zimbabwe, which increases the level of contributions due to the shame caused by public contributions. Andreoni and Petrie (2004) investigate how removing confidentiality affects giving, and they find an increase in contributions when the treatment considers observability of the decisions of all the subjects in the group. Noussair and Tucker (2007) study the effect of public observation on cooperation using a neutral experiment with complete observability, and their findings indicate that observability does not increase contributions permanently. Lopez et al. (2010) conduct a framed field experiment in Colombia considering different mechanisms to enhance cooperation. In particular, they find that the shame caused by the revelation of the contributions and the group's earnings loss provoked by the subject - randomly selected in the group - prevents contributions from deteriorating over time. This result differs from the stylized fact introduced previously, which is present in most of the literature on voluntary contributions to public goods. Finally, Denant-Boemont et al. (2011) develop a laboratory experiment that considers the ex-post observation of the contribution decisions, i.e. public observability of these. The authors find that this treatment does not increase average contributions.

My research tries to reconcile the results from Noussair and Tucker (2007) and Lopez et al. (2010). I explore whether shame, as a pro-social emotion to enhance cooperation, can be triggered by changing the number of individuals who have their decisions revealed to their group. Noussair's and Tucker's experiment considers the revelation of the contribution decisions of all the members of the group, while the Lopez et al. experiment reveals information about the contribution decisions and the group's earnings loss due to the decision of one randomly selected subject. In my experiment I consider the information disclosed by Lopez et al. in the context of four different treatments for revelation: 1) no revelation (baseline), i.e. the standard anonymous treatment with a positive frame; 2) partial revelation, which means revealing information of the decision of one subject in a group of five subjects; 3) random revelation, which means revealing information of the decisions of three subjects in a group of five subjects: and 4) full revelation, i.e. revealing the decisions of all members in the group. Additionally, I use different microeconometric models to explain the contribution decisions. The specification proposed by Lopez et al. (2010) includes the effect of time and interactions between this and the treatment effects; while Ashley et al. (2003, 2010) and Noussair and Tucker (2007) take into account of the effect of previous contributions, deviations of own contributions from the average contribution made for the other people in the group[1], and treatments effects. Ferraro's and Vossler's (2010) model considers the effect of previous contributions, deviation of own contributions with respect the average

[1] The inclusion of this variable allows consider personal or individual motives to contribute, which we discuss in detail in section 2.2.

contribution of the other people in the group, and an earnings feedback mechanism. Beside the previous models, I estimate models that mix the prior variables and include a group's earnings loss feedback mechanism.

The results of this study are presented in two parts. The first is related to the results of the experiment itself and the treatments considered, while the second relies on the microeconometric models used to explain the contribution decisions. A graphical analysis and other tests comparing contributions suggest that there are statistical differences in the mean and median contribution between the revelation treatments and the baseline. However, there is no difference in the mean and median contributions between random and full revelation treatments. This result supports the idea that random revelation, together with the disclosure of information about some subjects' decisions, is a good alternative to promote cooperation when revelation of all the subject's decisions is not viable. Moreover, I observe the reduction in contributions over time that is observed by other authors. However in the random treatments, particularly in random revelation, contributions decay by less than 40% between the first and the last period.

I need to highlight that the estimators of the microeconometric models that I use to explain the contribution decisions are inconsistent (Cameron and Trivedi, 2005) when I include lagged dependent variables. However, other authors [Ashley et al. (2003, 2010)[2] and Ferraro and Vossler (2010)] use these variables in their models, despite this problem. Only Barr (2001) tries to overcome this trouble by using the differenced generalized method of moments to estimate a fixed effect model. I estimate a random effects model with and without these variables in order to determine if there are differences in the results. Because the inclusion of previous contributions affects the sign and significance of some coefficients, I present these results only for illustrative purposes, while I analyze in detail those models without these variables. My findings present evidence of the presence of altruism across several microeconometric specifications, which contrast with the findings of Noussair and Tucker (2007) and Ashley et al. (2010), who find instead evidence of positive and negative reciprocity. I think that this discrepancy could be due to

[2] These authors indicate that they rely in fixed-effects regression estimates because they provide them with information about the effect of the variables includes in the regression, even though they recognize the inconsistency of these estimators and that they should use a first-difference estimator. However, this is not done because it limits the number of observations available.

the frame and the feedback that I use. Furthermore, the interaction between those and the random revelation treatment could be causing these results.

In contrast to the study of Lopez et al., I find that revealing the decision of a single subject at random does not significantly increase cooperative behavior. I attribute this discrepancy to the difference in subject pool. It seems to be easier to induce groups of people related through a common pool resource to choose cooperative behavior than the standard student subject pool. In fact, my findings indicate that cooperation is triggered only when I reveal information of 3 or all the subjects in the group.

The results of the model of Ashley et al. (2003, 2010) provide evidence of altruism and positive reciprocity, but not matching in contributions, as the model of Ferraro and Vossler (2010). I think the last result is due to the earnings feedback mechanism used in my model, which is different from that proposed by the authors due to the lack of variability in some variables in the sample.

The next steps for this research should include the use of the difference generalized method of moments estimator for those models that consider lagged dependent variables or a model in differences such as the proposed by the Arellano and Bond estimator. Additionally, it will be interesting to compare my results with those of Lopez el al (2010), using the microeconomic models presented in the present research. Finally, it would be useful to revisit my results for the random treatment when a neutral frame is considered.

1.2 Research Objectives

The objective of this research is to provide a better understanding of how sensitive cooperation is to different degrees of revelation. In particular, the general objective is to investigate the ability of revelation to enhance cooperation in a public good game, and the specific objectives include the identification and comparison of the ability of different revelation schemes to enhance cooperation in relation to the baseline or “anonymity” treatment. Moreover, I address the consistency of the results of Noussair and Tucker (2007) and Lopez et al. (2010) with a different subject pool.

CHAPTER 2

LITERATURE REVIEW

This section presents the literature review for two main topics. The first one is related to the ability of public revelation to enhance cooperation in a public good experiment; while the second is related to how different microeconometric models explain the contribution decisions.

2.1 Public Revelation

In the context of this research, I define public revelation as the process that makes the actual contribution decision of each member of the group public information. On the other hand, random public revelation randomizes the revelation process, by revealing information only for randomly selected subjects of the group.

Noussair and Tucker (2007) consider whether the existence of public revelation promotes cooperation to a public good in a multi-period context. This experiment uses a neutral frame and a subject pool of undergraduate students from economics and statistics courses. The treatments are: public observability (PO), no observability (baseline) and transferability of social approval or disapproval in a game with anonymous players. The experiment lasts 20 periods, where the first 10 are conducted using paper-and-pen and the last 10 periods are conducted in a computer lab. For my work, the first two treatments and the first 10 periods of the experiment are relevant. In the PO treatment, the individuals are called at the end of each period to write their contributions on a blackboard; while in the baseline treatment, the experimenter record the amount contributed for each individual on a blackboard without revealing the identity of the subjects. The authors find that public revelation provoked a temporary increase in the level of contributions.

Lopez et al. (2010) evaluate the effect of external regulations and pro-social emotions to increase contributions to a public good. The authors use a framed field experiment which is conducted in two local communities of fishermen in Colombia and it last 15 periods. The frame is a “public reminder about benefits of cooperation” (pp. 5) that points out the social cost of contributions below the full endowment that subjects receive at each period. The authors conduct 6 different treatments. The first is the baseline or anonymity treatment, while the second is the baseline plus a public reminder about the gains derived from cooperation. Also, there are two external regulatory treatments. In both a regulator audits one of the 5 subjects in each group; the difference between them is how noncompliance was penalized. In one treatment, the authors set a high penalty to induce full compliance, while in the other one there is a low penalty that is insufficient to induce full compliance. Finally, the last two treatments investigate social sanctions. In this context, the audited subject receives a reminder about how her decision affected the earnings of the rest of the group. When the reminder is made public, the authors are trying to induce shame, and when it is private they are trying to induce guilt. Because I am investigating whether revelation of the contribution decisions enhances cooperation, the results of the baseline and the shame treatments are relevant for this study. The baseline is the same used by Noussair and Tucker (2007); but the shame treatment is different, because Noussair's and Tucker's PO treatment consider full revelation of contributions. Also, the information revealed is different. Lopez et al. reveal information about the contribution decisions and the associated group's earning loss, while Noussair and Tucker only provide information about contributions. Moreover, there are some differences in how the experiments are conducted. While Lopez et al. develop a framed field experiment that highlighted the effects of cooperation; Noussair and Tucker conduct a neutrally framed lab experiment with students. Finally, the results from these studies are also different because Lopez et al. find that public revelation of one subject's contribution decision and the group's earnings loss due to this decision enhances cooperation, by permanently and significantly increasing average contributions and earnings.

More recently, Denant-Boemont et al. (2011) study how the contribution decision is affected by pre-play announcements and ex-post observation. At the beginning of each round, each subject made a pre-play announcement about her intended contributions, while the ex-post observation is Noussair's and Tucker's PO. The treatments considered by these authors are: announcement (A), observability (O) and announcement and observability (AO). The experiment uses a subject pool of undergraduate students from business and economics courses. The experiment has a neutral frame lasting 30 periods and it is fully computerized. The periods are divided into three segments of 10 rounds[3], and the subjects know the duration of the segment but they do not know how many segments they would play. For this research the relevant treatment is observability, and as Noussair and Tucker (2007), the authors find that "making contribution decisions public has no significant effect on the average contribution level" (pp 209), but they discover that a combination of pre-play announcements and observability affects the contribution decisions, because this increases contributions in relation to the baseline.

When I compare the studies previously mentioned, I notice that the shame treatment of Lopez et al. (2010) is a special case of the PO of Noussair and Tucker (2007) and of the ex-post observation of Denant-Boemont et al. (2011), but with a completely different effect on contributions. This difference may be due to a number of factors. In this paper we focus on: 1) the information being revealed, since the treatment in Lopez et al. reveals subjects' contributions and the group's earnings loss, while the Noussair and Tucker and Denant-Boemont et al. only reveal information about contributions; 2) the frame in the experiment, while Lopez et al. evoke norms of cooperation in their associative framing[4], Noussair and Tucker, and Denant-Boemont et al. use a neutral framing; and 3) the subject pool, the first study worked with communities of fishermen in developing countries while the last two used undergraduate students. Next, I present literature that considers these differences.

Barr (2001) develops two field paper-and-pen experiments with communities in the rural Zimbabwe, which are framed in a similar way to Lopez et al. (2010). For my study, her first experiment is relevant. In this experiment, each subject knows that her group's partners are from her village, but does not know their identity. In each session, the author considers three games[5]: the first two are the baseline (anonymous contributions) while the third considers public contributions without communication as in Noussair and Tucker (2007). Her results suggested that shame of future interactions with other subjects in their group provokes an increase in the

[3] The authors developed 7 sessions. The first six of them consider a VCM for the first and third segment; while in the second segment consider the treatments under analysis. In the seventh session, the authors reverse the order of the treatments, and they consider the AO treatment at the first and third segment, while in the second segment are played the VCM.
[4] The terms associative and non-associative framing are used following the definition in the experiment of Rege and Telle (2004).
[5] Unfortunately, the author does not specify the number of periods considered for each game.

level of contributions[6]. Therefore, and as in Lopez et al., shame-based sanctions applied to real life communities help to promote cooperation.

Andreoni and Petrie (2004) evaluate whether removing confidentiality affects giving in a series of public goods experiments. The authors develop a neutral frame fully computerized experiment with public observation. The experiment considers a matching partner treatment for eight rounds, and then the subjects are switched into other groups until each one of them plays in 5 different groups. The treatments under analysis are baseline, information, identification and information and identification together (II)[7]. For this research, the combined II treatment is relevant, because each subject knows exactly the contribution of the others subjects in their group, which resembles the PO treatment of Noussair and Tucker (2007) and the ex-post observability of Denant-Boemont et al. (2011)[8]. Andreoni's and Pietre's results indicate that the information treatment increases contribution over all the rounds, but the Information and Identification treatment increases contributions the most (59% more than the baseline), a result that is similar to the result of Lopez et al. (2010).

Taking into account the previous findings, field experiments (Lopez et al., 2010; and Barr, 2001) and traditional laboratory experiments (Andreoni and Petrie, 2004) give support to the hypothesis that pro-social emotions enhance cooperation. However, there is also evidence against this proposition (Noussair and Tucker, 2007; and Denant-Boemont et al., 2011). In this context, I have two hypotheses about this result. The first one is related to that field experiments per se introduce some type of pro-social biases to the experiment. Lusk, Pruitt and Norwood (2006) find that framed field experiment generates more pro-social emotions than a natural experiment. The experiments of Noussair and Tucker (2007) and Denant-Boemont et al. (2011)

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[6] However, Barr conduct a second experiment to directly address the "shame sanction" by allowing the participants to discuss their decisions after each round, to really see the shame sanction in action. The results of this second experiment indicate that low and high contributors attract criticism as a sanction, which provokes them to increase and decrease their contributions, respectively, in the following games.

[7] The authors introduce the II treatment by considering of pictures of the subjects in the group, which are associated with their contributions in each round. In the I treatment, the subjects only get information about contributions, i.e. they do not know who made it.

[8] Andreoni and Pietre (2004) and Denant-Boemont et al (2011) use a fully computerized environment to collect the data about contributions, while Noussair and Tucker (2007) allow the participants to sit together in a table and after they made their contributions they collect this decisions using an "envelop system". However, the meta-analysis study perform by Zelmer (2003) indicates that a fully computerized environment does not affect the average contributions as a percent of the total endowment. Therefore, the different systems used to collect the data in the experiment should not affect the contributions' decision.

reveal information about the contribution decisions of all group members, using undergraduate students. The authors find that contributions do not increase. Therefore, it looks like pro-social emotions are triggered in established groups in real communities. While a group of students randomly selected to participate in an experiment are not able to replicate the richness of “real life” interactions in order to generate these emotions. However, Andreoni and Pietri (2004) find evidence of these emotions in a lab setting using this subject pool. The second hypothesis is about how differences in the information revealed to the subjects affect their decisions. Lopez et al. (2010) reveal the group’s earnings loss due to the contribution of a randomly revealed subject, while Noussair and Tucker (2007) reveal the contributions of each subject in the group. The different results from these two works suggest that the information feedback could be responsible for this discrepancy. The effect of this on the contribution decisions is explored by Nikiforakis (2010), who shows that the disclosure of information on others’ contributions and earnings has opposite effects. The former increases own contributions and the later decreases it, despite the information from both being equivalent. Therefore, the information about the group’s earnings loss is sending a signal about how one’s decision affects the whole group. Then the individuals whose decisions are revealed likely feel shame if they contribute less than their full endowment, which may drive them to avoid low contributions in the future.

There are other studies focused on the Voluntary Contributions Mechanism. The effect of public revelation is addressed first by Rege and Telle (2004) who find a positive and strong effect for this variable in a one shot game. However, more recently Martinsson et al. (2009) conclude that this effect is not statistically significant for experiments developed in Vietnam and Colombia, while Martinsson and Villegas-Palacio (2010) find weak evidence for this effect in a one shot game performed in Colombia. Nonetheless, all these studies are based on one shot games rather than multi-period games, which I use in this research to analyze the effect of different degrees of revelation.

For multi-period games, Benebou and Tirole (2006) suggest considering the strategic motives for increasing contributions, because these would motivate other subjects to increase their contributions. The experiment of Martinsson and Villegas-Palacio (2010) consider strategic motives, by asking the subjects for their unconditional contributions. In particular, my study does not consider this dimension, because this is not present in the experiments that I want to contrast.

In the next section I present an overview of the microeconometric models that different authors use to model the contribution decisions.

2.2 Modeling the Contribution Decisions

Now, I introduce the different microeconometric models used to explain the decision process behind voluntary contributions. My first reference is the work of Lopez et al. (2010). Their model includes interactions terms between their five treatments and three time intervals defined for the experiment; i.e. they are obtaining information about how the different stages of the game affect contributions ($C_{i,t}$) for each treatment. Their model is presented in the following equation.

$$\begin{aligned} C_{i,t} = \alpha_0 &+ \sum_{k=1}^{3} \alpha_{1,k} * I_{i,k} * Tr_{i,1} + \sum_{k=1}^{3} \alpha_{2,k} * I_{i,k} * Tr_{i,2} + \sum_{k=1}^{3} \alpha_{1,k} * I_{i,k} * Tr_{i,3} \\ &+ \sum_{k=1}^{3} \alpha_{1,k} * I_{i,k} * Tr_{i,4} + \sum_{k=1}^{3} \alpha_{1,k} * I_{i,k} * Tr_{i,5} + \varepsilon_{i,t} \end{aligned} \tag{1}$$

where *i* denotes the individual and *t* the period, α_0 is a constant, and $\varepsilon_{it} \sim N[0, \sigma_\varepsilon^2]$. The regressors are $I_{i,k}$ the k-time interval being considered, with k = 1, …, 3; $Tr_{i,j}$ the j-treatment under study, with j = 1, …, 5. In terms of my work, this model allows to verify whether time affects the contribution decisions and if this effect is different among treatments.

My second reference is the model of Ashley et al. (2003, 2010) and its restricted version used by Noussair and Tucker (2007). These authors model individual contributions in each period as follows (Ashely et al., 2010, p 18):

$$\begin{aligned} C_{i,t} = \alpha &+ \sum_{j=1}^{2} \rho_j C_{i,t-j} + \lambda_1 \max\left[C_{i,t-1} - \overline{C}_{i,t-1}, 0\right] + \lambda_2 \min\left[C_{i,t-1} - \overline{C}_{i,t-1}, 0\right] \\ &+ \sum_j \beta_j X_{ij} + \sum_j \omega_i z_{ij,t} + \sum_{j=1}^{M} \gamma_j D_{ij} + \varepsilon_{i,t} \end{aligned} \tag{2}$$

where *i* denotes the individual, *t* is the period, *α* is a constant, and $\varepsilon_{it} \sim NIID[0, \sigma_\varepsilon^2]$. The other variables are defined as follows:

$C_{i,t-1}$ and $C_{i,t-2}$: the contributions in the two previous periods, which try to measure how contributions made in earlier periods influence the current decision;

$\max[C_{i,t-1} - \overline{C}_{i,t-1}, 0]$: is the maximum between the difference in the previous own contribution ($C_{i,t-1}$) and the average contribution of the others subjects in the group in period *t-1* ($\overline{C}_{i,t-1}$), and zero. This variable is called Deviation from the Group positive (DFGpos);

$\min[C_{i,t-1} - \overline{C}_{i,t-1}, 0]$: is the minimum between the difference in the previous own contribution ($C_{i,t-1}$) and the average contribution of the others subjects in the group in period *t-1* ($\overline{C}_{i,t-1}$), and zero. This variable is called Deviation from the Group negative (DFGneg).

These two variables are intended to capture the dynamic of subjects' adjustment of contributions between periods. In period *t* the subjects know the average contribution of the other people in their group in period *t-1* ($\overline{C}_{i,t-1}$), then they consider the difference between their contributions and this average i.e. if there is a positive (DFGpos) or negative (DFGneg) deviation, and use this information to align their contributions with the others' decisions. The hypothesis behind this variables considers that if the subject is contributing more (less) than the average, she reduces (increase) her contribution in the next period;

X_{ij} : are the treatments effects;

z_{ij}: are additional regressors considered to model the contribution decisions; and

D_{ij} are subject fixed effects, which try to incorporate differences between the subjects participating in the study.

This second model is important due to its ability to incorporate others' motives to contribute. In particular, I am interested in verifying the size, sign and differences between the coefficients λ_1 and λ_2. Andreoni (1989) address different hypotheses related to these terms, in order to determine the motivation behind the contribution decisions. For instance, if contributions are a consequence of pure altruism, i.e. the individuals are only concerned with the total provision of the public good, the coefficients associated with DFGpos and DFGneg are positives and equals ($\lambda_1 = \lambda_2 > 0$). Another testable hypothesis is the presence of pure warm glow. If this hypothesis is true, both coefficients are zero ($\lambda_1 = \lambda_2 = 0$), because the subjects do not base their decisions in the contributions made for their group in the previous period. Also, I can test the hypothesis of reciprocity, i.e. if the individuals care about the contributions of other people in their group and make their decisions based on them. In this context, these coefficients have negative values. Then the individuals decrease (increase) their contributions in period t when they are contributing more (less) than the average of the other subjects in their group in the previous period. If they increase (decrease) their contributions in the same proportion when they are below (above) the average, there is evidence of matching or conditional cooperation, which implies $\lambda_1 = \lambda_2 < 0$. Therefore, this model is very powerful in terms of the hypotheses that can be analyzed.

The third and last model that I use is proposed by Ferraro and Vossler (2010, p 17), and is presented in the next equation[9].

$$C_{i,t} = \alpha + \sum_{j=1}^{2} \rho_j C_{i,t-j} + \lambda\left[C_{i,t-1} - \overline{C}_{i,t-1}\right] + \gamma\left[D_{i,t-1}\left(\pi_{i,t-1} - \pi_{i,t-2}\right)\right] + \varepsilon_{it} \quad (3)$$

As before, the authors assume a well behaved error term. There are similarities between equations (2) and (3), because both of them have explanatory variables related to the effect of previous contributions ($C_{i,t-j}$) and how deviations of own contributions with respect the average of others subjects in the group ($C_{i,t-1} - \overline{C}_{i,t-1}$) affect the actual decision. However, the variable used by Ferraro and Vossler summarizes in one variable the effect of the variables deviation from the group positive and negative proposed by Ashley et al. (2010). Consequently it is not possible to test for matching contributions in this model, because it is not possible to test if an individual responds in the same way whether they are contributing more or less than the average of the other subjects in their group in the previous period. In this model only can be tested the presence of reciprocity in a general way. Additionally, equation (3) includes a new regressor, which is a

[9] The original notation in Ferraro and Vossler was changed in order to appreciate clearly the similarities with the model in equation (2).

feedback variable related to the subjects' earnings. This variable is an interaction term between the change in the contribution decisions ($D_{i,t-1}$) and the differential in earnings ($\Delta\pi_{i,t-1}$) that subjects get in two consecutives periods. In particular, the variable $D_{i,t-1} = C_{i,t-1} - C_{i,t-2}$ is equal to 1 if the subject increases her contributions at period t-1; zero when he does not change it; and -1 when he decreases it. Ferraro and Vossler refer to this variable as the hill climbing mechanism. The variable $\Delta\pi_{i,t-1} = \pi_{i,t-1} - \pi_{i,t-2}$ can be positive or negative, which together with a positive (negative) hill climbing value indicates an increase (decrease) in contributions in the actual period if the subjects get increased (decreased) earnings in the previous period.

The value of this specification for my work is the feedback mechanism proposed. This mechanism highlights an important part of the decision process: how the information about the earnings that the individuals obtain from their own and others' contribution decisions affects their decision. In particular, I use a similar variable which takes account of the information that is revealed to the subjects in the experiment, i.e. about the group's earnings loss generated to the group for the subject(s) being revealed.

CHAPTER 3

METHODOLOGY

3.1 The Experiment

In order to reach the objectives of this study I conduct a paper-and-pencil experiment with partial computerization[10]. I choose this way to collect the data to closely replicate the experiments developed by Noussair and Tucker and Lopez et al.. Furthermore, this type of non-computerized environment is easier to replicate and explain to the subjects if I take this experiment to the field in the future. Additionally, I think that a computerized environment likely is not the best way to capture the dynamics behind the subject's decision process, perhaps driving the results against the role of pro-social emotions to enhance cooperation, which is under analysis in this research. In particular, I want to know whether the shame caused by the revelation of low contributions and the associated group's earning loss can trigger an increase in contributions for the next period.

Also, this experiment investigates how the level of cooperation is affected by changes in the likelihood of an individual having their contributions and the group's earnings loss resulting from her decision revealed. The degree of revelation is an important variable to be considered, due to the fact that decisions made in social interactions commonly are not completely observable. In this context, I assume that these decisions can not be perfectly observed, but some of them can be known by interested individuals. These "revealed decisions" disclose information about the behavior of the group's member, which other subjects can use to make their own decisions in the next period. In particular, I sustain that the revealed information can trigger pro-social emotions to enhance cooperative behavior to verify the validity of the results of Noussair and Tucker (2007) or Lopez et al. (2010).

I use the data base of the Experimental Economic Program of the Department of Resource Economics, which is composed of undergraduate students of the University of

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[10] Friedman and Sunder (1994) describe partial computerization as a method in which the "subjects use paper and pencil to record their choices, to gather the pieces of paper, and to enter the data into a notebook computer which computes the outcomes while the subjects wait" (pp. 63).

Massachusetts at Amherst, to recruit my subject pool. Some of the subjects in the study have previous experience with computerized experiments but none in the VCM.

In the experiment, I employ five-person groups, each one of them with the same composition throughout the experiment, i.e. a partner matching protocol (Croson, 1996; Noussair and Soo, 2008; and Mengel and Peeters, 2011). Each one of the subjects receives a set of instructions to ensure that they understand the decisions that they would make during the session. The instructions help them to understand how the experiment works by answering questions about it and playing a practice round. After the instructions, the subjects play 10 rounds of contribution decisions. In each round, before the decisions are made, the subjects heard an announcement about how their decisions would affect the earnings of the other group members. During the session the subjects are reminded to keep an accurate and updated record of the information solicited in the cards[11]. Moreover, they are required to avoid any type of communication with the other subjects in the room.

The treatments of the experiment vary how many subjects in each group are selected to have their decisions "revealed" to the group. A baseline considers the "anonymity" case, where none of the decisions are revealed.

The information revealed, i.e. the feedback that the subjects receive after they make their contributions, considers their own contribution and the group's earnings loss due to this decision as in Lopez et al. (2010). This feedback is different from those used in previous studies, which only consider information about contributions (Barr, 2001; Andreoni and Pietri, 2004; Noussair and Tucker, 2007; and Denant-Boemont et al. 2011).

3.2 Experimental Design

As I briefly stated in the previous section, the treatments vary the degree of revelation (from poor or random to perfect revelation). Before I introduce more information about this, I want to clarify the difference between this work and previous studies in terms of the information that is revealed. Along the studies in the field of VCM I find disclosure of information about the group's

[11] The subjects receive at the beginning of the experiment a set of instructions with the material that they need to complete during the experiment. In the next section I present the material that they need to fill out.

earnings loss (GEL) and/or others' contributions ($C_{i,t}$). The information about GEL is part of the shame treatment used by Lopez et al. (2010), and it considers revealing information about the group's earning loss due to contributions lower than the endowment received by the subjects in each round. The treatments of Barr (2001), Andreoni and Petrie (2004), Noussair and Tucker (2007), and Denant-Boemont et al. (2011) reveal only information about $C_{i,t}$. However, my experiment provides feedback for both GEL and $C_{i,t}$, as in Lopez et al. (2010).

The design of the experiment considers varying the degree of revelation of the individual's decisions, which allow determining whether cooperation in a public good game is sensitive to the number of subjects whose decisions are revealed. In this context, I have four treatments:

1) Baseline (B), which considers no revelation and no information feedback, i.e. this is the classic anonymity treatment;
2) Partial revelation (RR1) or poor observability, which is present in Lopez et al. (2010), and it considers revealing information of one randomly selected subject in a group of five;
3) Random revelation (RR3) or less than perfect observability, which is an intermediate treatment that takes account of the effect of more than one and less than "n" persons being revealed, with n the size of the group. In our case, we select 3 out 5 subjects; and
4) Full revelation (FR5) or perfect observability, which is used by Barr (2001), Andreoni and Pietri (2004), Noussair and Tucker (2007), and Denant-Boemont (2011), and it considers revealing the information about the decisions of all the subjects in the group.

Table 1 presents the possible treatments that rise from the combinations of feedback information and revelation. The mix of $C_{i,t}$ and FR5 is the treatment considered by Noussair and Tucker (2007) and GEL plus $C_{i,t}$ and RR1 is the shame treatment of Lopez et al. (2010). The treatments in this study are obtained from the mix of GEL plus $C_{i,t}$ and different degrees of revelation. Furthermore, this Table highlights that the most previous studies do not use the same feedback information format that I use here, so my results are not fully comparable with their findings. Additionally, I need to recall that I consider a positive frame to induce cooperation, which is only considered by the studies of Barr (2001) and Lopez et al. (2010).

Table 1: Possible Treatments

		Information feedback		
		No feedback	***GEL and*** $C_{i,t}$	$C_{i,t}$
Revelation of contributions	***No revelation***	Baseline		
	FR5			Barr (2001) Andreoni and Petrie (2004) Noussair and Tucker (2007) Denant-Boemont et al. (2011)
	RR1		Lopez et al. (2010)	
	RR3			

Note: The shaded cells are conducted for this study. Those marked are not.

My experiment follows a standard linear contribution game, with all the individuals facing the same return of 0.4 tokens for each token invested into the public good. Each subject receives an endowment of 25 tokens in each round, and they need to decide how much to contribute to the group's project account and how much to keep for themselves in each period.

For each one of the four different treatments I perform four sessions, each one consisting of 10 rounds. Therefore, our sample size is 80 subjects which provide 800 observations. The show-up fee paid to each subject is 5 USD and the rate of conversion from experimental money (tokens) to US dollars is 0.04 USD.

In order to identify possible problems with the general set up of the experiment, instructions, examples, missing information, coordination and timing issues, I performed two pilots of the experiment before running the paid sessions. After those, I incorporate the changes required to make the experiment fully understandable to the subjects.

3.3 Sessions

The experiment is conducted in Stockbridge Hall on the UMass-Amherst Campus, from October to December 2010[12]. In total I perform 18 sessions, but two of them were cancelled due to lack of subjects to start the experiment. Each session involved one group of five subjects and the experimenter. The experimenter conducted the experiment, collected the information on her computer, calculated the round earnings and filled out the reminder to be presented to the group each round.

Each session began by asking the subjects to pick a numbered ball from a bag, in order to select their desk in the room. Once they were seated, the experimenter asked them to review and sign of the consent form to participate in the experiment. After the forms were collected, she read the instructions for the experiment (See Appendix A through D for more details). The instructions included one practice round and a few multiple choice questions to verify that the subjects understood the experiment. After the subjects finished these questions, the experiment began. At the end of the tenth round the experimenter asked the subjects to complete a questionnaire (see Appendix E) with information about their demographics characteristics. While the subjects filled out this information, the experimenter calculated their earnings for the session. When the subjects finished the questionnaire they were called to receive their compensation for participating in the experiment, which was enclosed in an enveloped with the number of the desk assigned to each participant. This guaranteed that the earnings from the experiment remained private.

3.4 Material for the Experiment

The material received by the subjects during the experiment consisted of 10 decision cards and a calculation sheet. Also, they were provided with extra paper, a calculator and pens. The format of the decision card and calculation sheet together with the instructions for the experiment were based on those used by Lopez et al. (2010), but they were modified to take account of the degree of revelation.

[12] However, due to problems (a participant who was under 18 years of age) with one session in the Baseline treatment, this one was excluded from the data base and it is replaced by a new session conducted in November 2011.

In each round, the subjects were asked to fill out a decision card (see Figure 1). This card collected information about the participant number, the round being played, and the subject's contribution decision, which is disaggregated to consider how many tokens they keep for themselves and how much they contribute to the group in each round. Moreover, in each session the subjects maintained a calculation sheet (see Figure 2), which was a permanent reminder of their previous decisions and their earnings in the different periods of the game. Also, they recorded in this sheet whether their decisions are revealed in each round.

Figure 1: Decision Card

DECISION CARD	
Participant Number:	
Round Number:	
Tokens I keep for myself:	
Tokens I contribute to the group project:	

The feedback information that the group received in the RR1 (partial revelation), RR3 (random revelation) and FR5 (full revelation) treatments are presented next. After the subjects made their contribution decisions, the experimenter collected the decision cards and recorded this information. Then she used a bag with numbered balls to select which subject(s) were revealed. Then, the experimenter walked to the subject to be revealed and looking at her face read the group a reminder, which was also projected on the board, about how her individual decision harmed the group's earnings. This reminder is presented in the Figure 3. If the revealed subject(s) contributed all her (their) tokens, the group is given a reminder about how the decision of this (these) subject(s) improved the payoff for the entire group. The Figure 4 presents this reminder.

Figure 2: Calculation Sheet

Participant number ____________

CALCULATION SHEET

In this sheet you will keep a record of your decisions and earnings. Please fill out the sheet right after you finish each round.

A	B	C	D	E	B + E = F	G
Round Number	**Tokens I keep for myself**	**Tokens I contributed to the project**	**Total tokens contributed to the project**	**Tokens I earned from the project**	**My earnings in each round**	**Player selected in this round (Yes/No)**
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

Please, at the end of the experiment leave this sheet and all the material that you received at your desk. Thank you.

Figure 3: Reminder to be read loud if the subject **did not** contribute all his or her tokens to the group project

The earnings of the group are the highest when everybody contributes all her or his tokens to the group					
Message	**Participant Number**				
	1	**2**	**3**	**4**	**5**
Tokens you contributed to the group project					
Total tokens contributed to the project (by the 5 players)					
Total tokens contributed to the project if you had contributed all your tokens					
Losses for the group because you did not contributed all your tokens					

Figure 4: Reminder to be read loud if the subject **did** contribute all 25 tokens to the group project

The earnings of the group are the highest when everybody contributes all her or his tokens to the group					
Message	**Participant Number**				
	1	**2**	**3**	**4**	**5**
Tokens you contributed to the group project					
Total tokens contributed to the project (by the 5 players)					
You contribute all your tokens to the project that means you did all you could to make the earnings for the group the highest					

The complete instructions for the experiment together with the survey that the subjects answered after the game are included in the Appendices A through E.

CHAPTER 4

RESULTS

This chapter presents the main results of this research divided into four parts. In the first one, I present the characteristics of our sample data, while in the second I characterize the results for the contribution decisions. The estimation methods used to model this decision are described in the third part, while in the last one I explain the results obtained from the estimation of different microeconometric models.

4.1 Sample Characteristics

The experiment involved 16 sessions each comprising one group of five subjects for a total of 80 subjects. Sessions were conducted at the University of Massachusetts Amherst during November and December, 2010[13]. The recruitment was done using the database[14] of the Experimental Economic Program (Department of Resource Economics) from which I selected a total of 80 subjects who had never participated in a similar experiment.

The descriptive statistics for the subjects' demographics characteristics and their responses to the survey[15] are presented in Appendix F. The average age for the subject pool is 22 years and 52.50 percent are male. Eighty-seven percent of the participants in the study are undergraduate students, while the rest are graduate students. Twelve percent of the subjects had not declared a major, while 35% of them are studying programs related to economics and business such as economics, resource economics, accounting, finance, etc. However, 67.5% of the sample has never taken a course in economics. Additionally, for 57.5% of the subjects this is their first experiment and only 15% of the sample knew other people in their group.

The experiment lasted almost one hour, and the average compensation received for the subjects' participation was $21.24 USD (2.73 s.d.). However, there are differences in the compensation between treatments. In treatment B the subjects received in average 19.26 USD

[13] See footnote 15.
[14] This data base allows recruitment of undergraduate and graduate students who were enrolled in it.
[15] The subjects respond the questionnaire after they finish the experiment and while they are waiting to be called to receive their compensation.

(2.24 s.d.); in RR1 20.54 USD (2.63 s.d.); in RR3 22.65 USD (1.97 s.d.) and in FR5 22.50 USD (2.67 s.d.).

4.2 Results Characteristics

Figure 5 presents the distribution of the fraction of endowment contributed by treatment. The histogram for the baseline (B) treatment and the partial revelation (RR1) are similar, because none of those exhibit a clear pattern for contributions. In the B treatment 19.5% of the people contribute zero percent of their endowment, while 13% do so in the RR1. However, the whole endowment is contributed by 12% of the people in B and by 21.5% in RR1 treatment. The histogram for contributions when I randomly reveal the decisions of three (RR3) and five (FR5) subjects looks similar, but zero contributors are more likely to be found in FR5, while the maximum contribution was made for 46.5% of the subjects in RR3 and 58.5% in FR5.

Figure 5: Histogram of the fraction of endowment contributed ($C_{i,t}$) by treatment

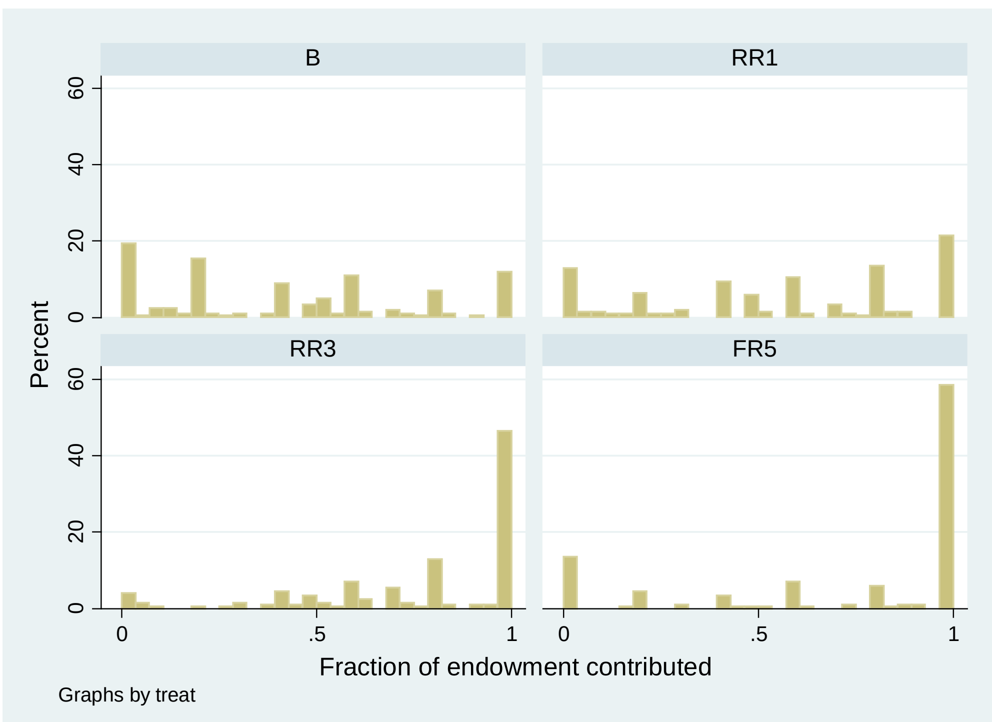


Table 2: Summary of Contributions ($C_{i,t}$)

Treatments	Mean of Contributions	Median of Contributions	Mean of the Fraction of endowment contributed[1]	Number of observations
B	10.55 (0.589)	10	0.422 (0.024)	200
RR1	13.92 (0.612)	15	0.557 (0.024)	200
RR3	19.19 (0.505)	20	0.768 (0.020)	200
FR5	18.54 (0.657)	25	0.742 (0.026)	200

[1] The fraction of endowment contributed is the ratio between actual contributions and 25, which is the endowment that subjects get in each round.
Note: Standard errors are presented in parenthesis under the mean for contributions and for percentage of endowment contributed.

Result 1: The treatments have different effects on the contribution decision.

Table 2 presents a summary of contributions by treatment. There are differences between treatments, with the mean contribution made in B being the lowest and those made in RR3 the highest. But if I consider the median of this variable, the highest level of contributions belongs to FR5. There is also similarities among RR3 and FR5 treatments, with a mean (median) value for contributions in RR3 of 19.19 (20) tokens and in FR5 of 18.54 (25) tokens. To verify if both treatments have a similar effect on contributions, I need to test whether there is a statistical difference between them, and I do this by using the Kruskal-Wallis test and the Mann-Whitney Rank Sum test. I perform these tests instead of the traditional t-test because the sample is not large enough to satisfy its assumption “that the distribution of the sample means follows the normal distribution” (Lind et al. (2005), pp. 358) and because these two statistics are more flexible since they do not require any distributional assumptions. However, to develop these tests I must consider the necessity of independent observations for the contribution decisions (Motulsky (1999), pp.5). In this study the observations are not independent because the subjects know the aggregated contribution in each period and they also get partial or complete information about others subjects’ decisions in the RR1, RR3 and FR5 treatments. Then, in a given group, it is likely that observations across subjects and over time are not independent. To overcome this problem, I use the average contribution per group, i.e. I considered 4 observations for each treatment. Given this small sample size, I need to take the results from these tests with caution. In particular, for the Kruskal-Wallis test, because our sample does not reach the minimum of 5 observations required to have a Chi-square distribution. The results for these tests are presented in Table 3 and 4.

Result 2: Revelation increases contributions, but the RR3 and FR5 treatments are statistically indistinguishable.

Figure 6 presents the box plot for the fraction of endowment contributed by treatment, and it clearly shows differences among them. In particular, any kind of revelation increases the average and median contribution, in comparison with the Baseline. However, this Figure suggests that the distribution of the fraction of endowment contributed in RR3 and FR5 treatments are similar, except for their medians (0.8 for RR3 and 1 for FR5). Additionally, the Kruskal-Wallis test (Table 3) indicates that there is a statistically significant difference among our four treatments at a level of significance of 10%. Therefore, I find evidence indicating that the degree of revelation has a differentiated impact on the contribution decisions.

Additionally, Table 4 presents the results for the Mann Whitney Rank-sum test for differences in the mean and the median of contributions between pairs of treatments. This test gives evidence of differences in the means between B and RR3, and B and FR5. Thus, the presence of revelation of the decisions of more than one subject appears to change the level of contributions with respect to the baseline. However, I must highlight that this result differs from Lopez et al. (2010), because these authors find that their shame treatment, my RR1, is statistically different from their frame treatment (B in my case). In particular, the former exhibits higher levels of contributions during the experiment. Since the only difference between their experiment and mine is the subject pool, it could be that this weak type of revelation is not enough to enhance contributions when the subjects do not have a common background and relationships such as those presented in the fishing communities of Lopez et al..

Figure 6: Box Plot for fraction of endowment contributed by treatment

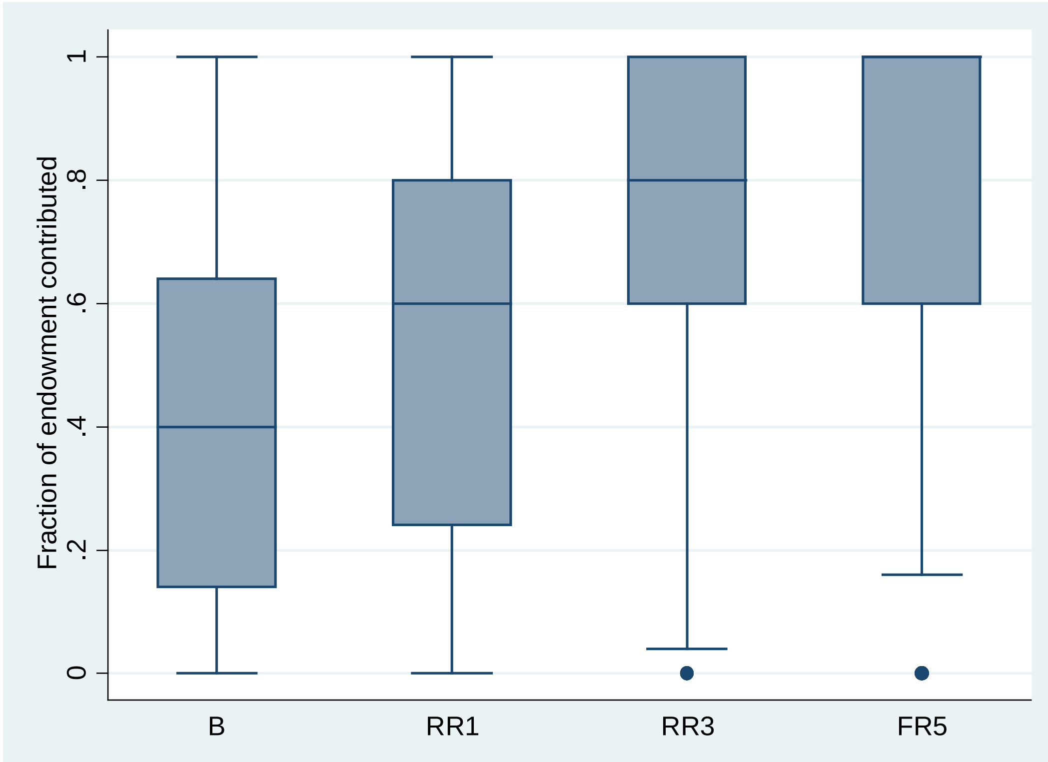


Table 3: Kruskal-Wallis (K-W) test for equality of populations.

Treatments	**Number of observations**	**Contributions**	
		Average Rank Sum	**Median Rank Sum**
B	4	15.00	16.50
RR1	4	30.00	29.00
RR3	4	49.00	49.00
FR5	4	42.00	42.50
K-W test		$\chi^2_{(3)}$ = 7.346, p-value= 0.062	$\chi^2_{(3)}$ = 6.756, p-value= 0.080
		$\chi^2_{(3)}$ with ties= 7.346, p-value= 0.062	$\chi^2_{(3)}$ with ties= 6.887, p-value= 0.076

Note: The values for this statistic are not affected by the way in which I measure contributions, i.e. in levels or as fraction of endowment contributed.

Furthermore, the Mann Whitney Rank-sum Test indicates that the median between B and RR3, and RR1 and RR3 are statistically different at the usual levels of significance. Despite of these differences, the test indicates that the mean and median of RR3 and FR5 are not statistically different. A possible explanation for this result may be that contributions depend on how the subjects in the study evaluate the degree of revelation. Because the subjects made similar contributions in both treatments, it looks like they find the probability of being revealed in RR3 high enough to motivate them to contribute as if they were in a full revelation environment.

Table 4: Results Mann Whitney Rank-sum Test for Contributions

Test between treatments		Results for mean contributions		Results for median contributions	
		Z	p-value	Z	p-value
B	RR1	-1.155	0.248	-1.162	0.245
B	RR3	-2.309	0.021 **	-2.323	0.020 **
B	FR5	-2.021	0.043 **	-1.607	0.108
RR1	RR3	-1.443	0.149	-1.786	0.074 *
RR1	FR5	-0.866	0.386	-0.893	0.372
RR3	FR5	0.577	0.564	0.298	0.766

Notes: (1) Contributions are measured as the average by session (4 observations by treatment). (2) The values for this statistic are not affected by the way in which I measure contributions, i.e. in levels or as a fraction of endowment contributed. (3) *** 1 percent significant level, ** 5 percent significant level, * 10 percent significant level.

In the Figure 7 I present the evolution of contributions, measured as the fraction of endowment contributed, over time. Recall, that Table 4 indicates that the mean and median contribution for RR3 and FR5 treatments are not statistically different. However, when I consider their evolution over time, there is a different pattern for these two treatments. In FR5 the contributions level increases in the first four rounds to decline consistently to the end of the game. While in RR3 the contributions increase in the first two rounds to start to decrease after that, but these increase again in rounds 7 and 8, to fall after that until the end of the experiment. Also, at the last round the contributions in RR3 are 3.05 tokens higher than in FR5 treatment, although these treatments have almost the same level of contributions in the initial round. Furthermore, this Figure shows some similarities between the B and the RR1 treatments. Both treatments have almost identical initial contributions levels but then their pattern diverges. In B the contributions fall significantly after the first round and then these increase for periods 6 and 7 to fall again. Meanwhile the contributions in RR1 only decrease after the third round, to then be almost at the same level for a few periods until they start to decrease at round 7. At the end of the game, the level of contributions in RR1 is 2.75 tokens higher than in B treatment; while in RR3 are 7.2 tokens higher.

Figure 7: Mean fraction of endowment contributed per round by treatment

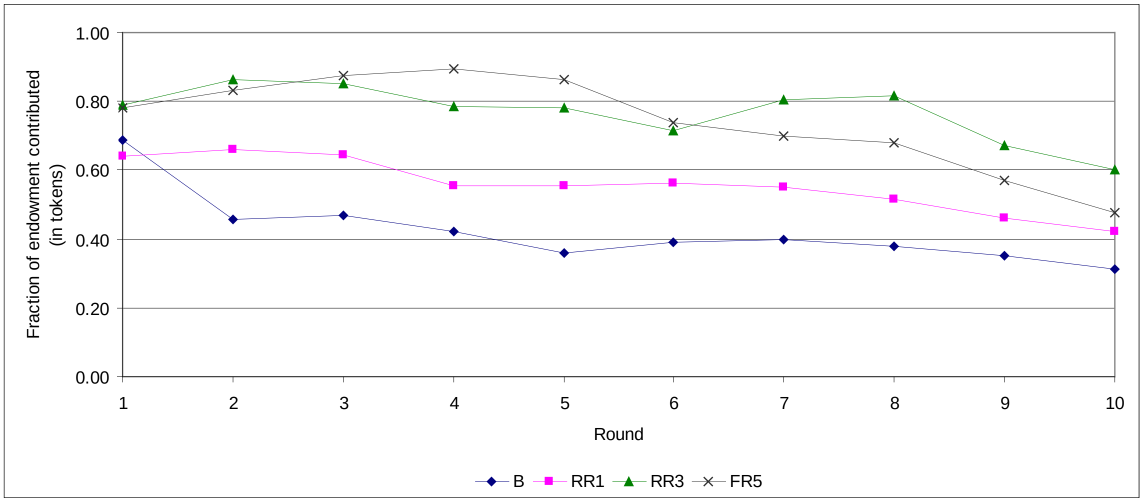
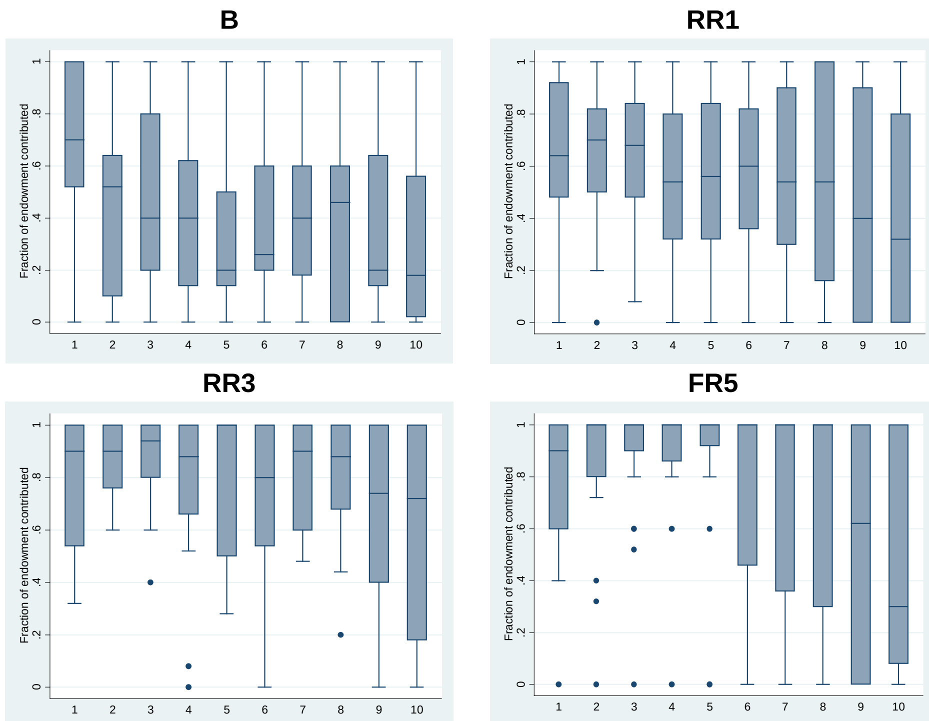


Figure 8 presents a box plot for the distribution of the fraction of endowment contributed by treatment over time. Contributions in B treatment are lower than in the other treatments, except in the first period. While the distribution of contributions in RR3 and FR5 treatments looks very similar, except that FR5 exhibits a greater dispersion and its median is consistently decreasing over time. Therefore, the results from Table 4 and Figure 6 can be considered valid in terms of average data, but when I include the time-dimension in the analysis there are differences between these two treatments.

Furthermore, Results 1 and 2, together with the evidence in Figures 7 and 8 about the differentiated time-effect of the treatments over the contribution decisions are a motivation to explore more deeply how these treatments work. In this context, the next section presents the estimation methods used to model the contribution decisions, while the last one shows the estimation results for the microeconometric models considered.

Figure 8: Box Plot for fraction of endowment contributed by treatment over time



4.3 Estimation Methods

The strategy used to model the contribution decisions consists of several steps and all of them use two measures for the dependent variable: contributions and fraction of endowment contributed. Next, I explain these steps.

1) Estimation of models that employ as regressors the treatments and the duration of the experiment.

These models are estimated by Ordinary Least Squares (OLS) using two different approaches to measure the dependent variable. The first considers the average of this variable by group ($\left(\frac{1}{5}\right)\sum_{i=1}^{5}\left[\left(\frac{1}{10}\right)\sum_{t=1}^{10} C_{i,t}\right]$), with i the number of subjects in the group and t the number of rounds that last the experiment, while the second takes the average by individual ($\left(\frac{1}{10}\right)\sum_{t=1}^{10} C_{i,t}$)[16].

[16] When contributions are aggregated by group, I have four observations for each treatment; while by individual, I have twenty observations by treatment. Therefore, the main difference between these procedures is the number of observations available to estimate the models.

The dependent variable, contributions, is denoted by $\overline{C_i}$ in the next equations. The first model estimated is presented in equation (4.1) and it only considers as explanatory variables the treatment effects (RR1, RR3 and FR5).

$$\overline{C_i} = \alpha_0 + \alpha_1 RR1_i + \alpha_2 RR3_i + \alpha_4 FR5_i + \varepsilon_i \qquad (4.1)$$

The results for this model, considering the average contribution by group, are presented in Appendix H. Models A.1 and A.2 indicate that the constant, related with the baseline treatment, and RR3 and FR5 treatments have an statistically significant effect over the contribution decisions. This finding is validated by Models D.1 and D.2, which use the average contribution by individual as dependent variable[17]. Therefore, there is evidence about the positive effect of RR3 and FR5 over the contribution decisions.

The second model, in equation (4.2), does not take account of the treatments and only considers the effect of time over the contribution decisions. The estimated models, B.1 and B.2, indicate that time does not affect negatively the contribution decision as we may expect. However, this result should be considered with caution because we are not taking into account the differences among the treatments under analysis.

$$\overline{C_i} = \alpha_1 Time + \varepsilon_i \qquad (4.2)$$

The last model, in equation (4.3), considers the effect of the treatments and time together. The results are presented in Model C.1 and C.2, and they indicate a positive and significant effect for RR3 and FR5 treatment and the time variable.

$$\overline{C_i} = \alpha_1 RR1_i + \alpha_2 RR3_i + \alpha_4 FR5_i + \alpha_4 Time + \varepsilon_i \qquad (4.3)$$

[17] These models are using as individual data are implicitly carrying on the presence of groups or clusters in the data. This affects the validity of the statistics test but no the estimated coefficients. To take account of this problem the standard error are adjusted by the number of groups in the sample.

2) Estimation of a model that considers as regressors the treatments and the demographic characteristics of the subjects (vector z_i).

The model, in equation (5), uses as dependent variable the average contribution by individual. Then the estimation by OLS needs to consider the presence of groups or clusters in the sample, as before in Models D.1 and D.2.

$$\overline{C_i} = \alpha_0 + \alpha_1 RR1_i + \alpha_2 RR3_i + \alpha_4 FR5_i + \theta z_i + \varepsilon_i \qquad (5)$$

The results for this specification are presented in Appendix I. I find evidence that the effect of the demographics characteristics included in this model is not statistically different from zero, while the contribution decisions are driven exclusively by the treatment effects.

3) Estimation of a model that considers the effect of time in the contribution decisions.

The model is represented in equation (6) and it includes as regressors dummy variables for the periods 2 through 10. The results for the estimation of this model are presented in Appendix J, and these consider a version estimated with the complete sample (Model F) and segmented versions for each one of our 4 treatments (Models F.1 - F.4).

$$\overline{C_i} = \alpha_1 + \alpha_i \sum_{i=2}^{10} d_i + \varepsilon_i \qquad (6)$$

These models allow seeing how the time variable affects the contribution decision. For the complete sample, the intercept has a significant and positive effect, while for the last period this is significant and negative. These results are common to the five estimated models. However, I also find that for models for the baseline and for the random revelation treatments (RR1 and RR3), the time variables that are statistically significant carry a negative effect in the contribution decisions. But for the model with full revelation (FR5) the effect of time is positive for the periods 3, 4 and 5. Therefore, this simple model captures how the effect of the treatments is differentiated over time, except for the first and last period. Nonetheless, in the next section I conduct a specific test of how the treatments affect the end game.

4) Estimation of a model that considers the panel structure of our sample, i.e. information about the contribution decisions of 80 subjects in 10 different periods of time.

To estimate this model I can not use OLS, because the unobserved heterogeneity across the subjects in the sample. This is caused by their unobservable characteristics or behaviors, which can not be included in the model. Then there is omitted variable bias due to these factors. Furthermore, if this heterogeneity is correlated with the regressors included in the model, the estimates of OLS are biased and inconsistent. In this case I need to use a fixed effect model. If the unobserved heterogeneity is uncorrelated with the regressors included in the model I can use the random effect model (pp. 285, Green). Therefore, a fixed or random effect model must be used to take account of the unobserved heterogeneity.

In order to verify which of these econometric specifications is the appropriate, I perform Hausman's specification test for the model presented in equation (7). The null hypothesis for this test is no correlation between the individual effects with other explanatory variables included in the model, i.e. the fixed and random effect model should give the same estimates. Unfortunately, I can not compute this statistic because the fixed effect model only provides an estimate for the constant[18]; while the random effect model supplies estimates for the constant and the coefficients related with the treatments. This difference between the models makes them incomparable, and to overcome this problem I estimate a random effect model which allows getting estimates for all the parameters of interest.

$$C_{it} = \alpha_0 + \alpha_1 RR1_{it} + \alpha_2 RR3_{it} + \alpha_4 FR5_{it} + \varepsilon_{it} \tag{7}$$

From the previous discussion I know the type of model to be estimated, but I also need to consider that the contribution decisions, the dependent variable, is restricted to be a real number between zero and twenty-five (or between zero and one when considering the fraction of endowment contributed). Therefore, I need to censor the values for these variables in their lower and upper limits. The model that accommodates these requirements is a double censored Tobit model. Therefore, the last step involves the estimation of double censored models for each one of

[18] This problem is due to the lack of variability of the treatments over time, i.e. each subject faces only one treatment along her participation in the study.

the microeconometric models presented in Chapter 2 Section 2. These results are presented in the next section, along with the appropriate tests to choose between alternative specifications.

4.4 Estimation Results

In Appendix G I present the descriptive statistics for the variables considered in the microeconometric models. There are differences in the average values for the variables between treatments. For instance, the average initial contribution for the sample was 18.11 tokens, but when this valued is compared with those obtained in B (17.15), RR1 (16.05), RR3 (19.70) and FR5 (19.55) is clear that this average hides differences between the treatments under analysis.

Next, I present the results from the microeconometric models considered. The first model estimated is presented in equation (8) and only considers the effect of the treatments in the contribution decisions, while the second one, presented in equation (9), includes the time dimension by considering interaction terms between the treatments (Tr_k , with k = RR1, RR3 and FR5) and three time intervals: I_{1-3}, that cluster the first three rounds; I_{4-7}, for the next four rounds; and I_{8-10}, for the last three rounds. I refer to the first model as Model 1 and the second as Model 2.

$$C_{i,t} = \alpha_0 + \alpha_1 RR1_{i,t} + \alpha_2 RR3_{i,t} + \alpha_3 FR5_{i,t} + \varepsilon_{i,t} \tag{8}$$

$$C_{i,t} = \alpha_0 + \sum_{k=1}^{3} \alpha_{1,k} I_{1-3} Tr_{k,i,t} + \sum_{k=1}^{3} \alpha_{2,k} I_{4-7} Tr_{k,i,t} + \sum_{k=1}^{3} \alpha_{3,k} I_{8-10} Tr_{k,i,t} + \varepsilon_{i,t} \tag{9}$$

Result 3: The RR3 and FR5 treatments increase contributions, but there is no statistical difference between these.

Table 5 presents the results for the estimation of Models 1 and 2 using a double censored random effect model. Model 1 indicates that the RR3 and FR5 treatments have a positive and statistically significant effect over contributions (p-values<0.01), but there is no statistical difference between these two coefficients (p-value=0.829). This supports Result 2, because indicate that random revelation can affect the contribution decisions in the same way that full disclosure of information does.

Also, the constant term estimated for this model, which is related to the average fraction of endowment contributed over all rounds under the B treatment, is positive and statistically significant. The forecast ability of the model, measured by the correlation between the actual and fitted values for the dependent variable, is equal to 0.387. This value is relatively low which could be due to the fact that only the treatments are used as explanatory variables.

Table 5: Results for the Tobit random-effects model for the contribution decisions: the effect of time

	Model 1	Model 2
Variables	**Coefficients**	
Constant	0.413***	0.416***
	(0.110)	(0.111)
RR1	0.187	
	(0.156)	
RR3	0.621***	
	(0.159)	
FR5	0.586***	
	(0.159)	
T_{1-3}*RR1		0.302
		(0.163)
T_{4-7}*RR1		0.195
		(0.161)
T_{8-10}*RR1		0.039
		(0.163)
T_{1-3}*RR3		0.712***
		(0.168)
T_{4-7}*RR3		0.626***
		(0.165)
T_{8-10}*RR3		0.490**
		(0.167)
T_{1-3}*FR5		0.730***
		(0.169)
T_{4-7}*FR5		0.754***
		(0.168)
T_{8-10}*FR5		0.253
		(0.166)
LL	-532.039	-500.970
Observations	800	800
Left-censored	100	100
Uncensored	423	423
Right-censored	277	277
Number of groups	80	80

Note: (1) The dependent variable is measured as fraction of endowment contributed. (2) Standard errors in parentheses. (3) * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

In order to improve the forecast ability of Model 1 and to evaluate the effect of time in the different treatments, I include interaction terms between the treatments and three time intervals. The results of this estimation are presented in Model 2 in Table 5, which is similar to the model estimated by Lopez et al. (2010). The estimated parameter for the constant is very similar with the estimate in Model 1. Both are positive and statistically significant. The inclusion of the interaction terms brings evidence that time does not affect the performance of RR1, which supports the evidence from Model 1, because none of its interaction terms are statistically different from zero. Then, this treatment appears to have no statistically significant effect on the contribution decisions. However, for RR3 I find that all three intervals have a positive and significant effect on the contribution decisions, while for FR5 only the first and second intervals have a positive and significant effect. These results suggest that both RR3 and FR5 enhance cooperation. Moreover, where the effects seem to dissipate overtime for FR5 they do not for RR3.

Result 4: There is a differentiated time-effect between RR3 and FR5 treatments.

Figure 7 shows differences in the evolution of contributions for RR3 and FR5 treatments, which highlights the importance of the time horizon. Also this suggests that these two treatments increase contributions in relation to B, but the positive effect of FR5 begins to decrease after a few rounds while RR3 exhibits a more stable pattern. Using the results from Model 2 I tested if there are statistical differences in the interaction terms estimated for the treatments at each time interval. The statistic indicates to reject the null hypothesis of equality of the coefficients for these three treatments at the first (p-value=0.019), second (p-value=0.003) and third interval (p-value=0.033). But the test for differences between pairs of treatments presents evidence that the effect of RR3 and FR5 on the contribution decisions is not statistically different (p-values>0.170). However, when I tested the equality of these treatments effects for each time-interval, the evidence indicates that they are not statistically different over time (p-values<0.040) except in the last interval (p-value=0.009). But, the effects of these two treatments in the last time-period are jointly different from zero (p-value=0.013). Then, Model 2 provides support for a similar effect of RR3 and FR5 treatments in the first two intervals of the experiment, while in the last one this effect is positive but differentiated. Therefore, the Result 2 is confirmed by this model, i.e. there is evidence of the ability of RR3 to get a similar result to FR5.

Result 5: The effect of RR3 and FR5 do not disappear over time.

From the results of Model 2 (Table 5) RR3 and FR5 exhibit a statistically significant effect that lasts for all of the periods. To see whether contributions decay or not, I tested the significance (one-side test) of the coefficients associated with the interaction term for the last interval. The statistic fails to reject the null hypothesis for RR1 (p-values=0.405) and rejects it for RR3 and FR5 (p-values<0.07), which gives evidence that the positive effects of these two treatments do not disappear in the last time-interval. This result differs from Noussair and Tucker (2007) who find that the effect decays over time. However, there are two differences that can be triggering this discrepancy: first, these authors do not use a frame, as I do; and second they only reveal information about the contribution decisions, while I reveal the group's earnings loss as well. Therefore, these differences highlight the significance of the framing and the feedback information format to enhance cooperation.

To incorporate an end-game effect in the model, I consider the model presented in equation (6) and their results in Appendix J. I find a negative and significant end-game effect (p-values<0.05) for the model estimated for the whole sample and for each treatment. However, this effect is lower in absolute value for RR1 and RR3 than for the baseline, which indicates that the frame and treatments used help to attenuate the decline in contributions at the end of the game. Additionally, I tested the restricted specification (Model F) versus its unrestricted version (Models F.1 to F.4). The Likelihood-ratio (LR) test indicates reject the null hypothesis (Model with all sample) at 1% level of significance (p-value<0.001).

Next, I considered a model (Model 3) that takes account of the effect of 2-period lagged contributions and the treatments over the contribution decisions. When I compare Model 3 and Model 1, which is a restricted version of it, there is evidence against the restricted model (p-value<0.001). But I obtain an unforeseen result in the unrestricted model: a change in the expected sign for the estimates for the constant and for some of treatments[19].

Model 4 is based on the specification of Ashley et al. (2003, 2010) and Noussair and Tucker (2007), which is presented in equation (10). This specification includes as regressors lagged contributions ($C_{i,t-p}$); deviation from the group positive ($DFGpos_{i,t}$); deviation from the group negative ($DFGneg_{i,t}$); and the treatment effects: RR1, RR3 and FR5. Additionally, I estimated a reduced (Model 5) and expanded (Model 6) version of it, by excluding lagged contributions and including an alternative to the earnings feedback mechanism proposed by Ferraro and Vossler (2010), respectively. Also, I estimated this last model without lagged dependent variables (Model 7). These results are presented in Table 6.

$$\begin{aligned} C_{i,t} = \alpha_0 + \sum_{j=1}^{p} \rho_j C_{i,t-p} + \lambda_1 DFGpos_{i,t} + \lambda_2 DFGneg_{i,t} + \alpha_1 RR1_{i,t} + \alpha_2 RR3_{i,t} \\ + \alpha_3 FR5_{i,t} + \varepsilon_{i,t} \end{aligned} \qquad (10)$$

Result 6: The contribution decisions can not be explained completely by the treatments.

Table 6 presents the results for the econometric specification in equation (10). First, I used the LR test to compare Models 1 (Table 5) and 5, because the first one is a nested version of the last. This statistic indicates reject the restrictions imposed by Model 1 in the null hypothesis (p-value<0.001) and go with the unrestricted model (Model 5). Therefore, there are additional variables to be considered when we model the contribution decisions, such as positive and negative reciprocity. When I incorporated lagged dependent variables and I compare Models 1 and 4, still the null hypothesis (p-value<0.001) is rejected, but there are unexpected signs for the estimates for the constant and for some of treatments. Furthermore, none of the treatment effects are statistically significant. Cameron and Trivedi (2005) suggest that “The estimators from the previous chapter [for linear panel models] are all inconsistent if the regressors include lagged

[19] I expect positive signs for all this variables in the understanding that the treatments have a positive effect over the contribution decisions. However, the estimated coefficients for the RR3 and FR5 treatments and the constant are positive and statistically significant for Model 1; while in Model 3 the coefficients for these variables are negatives and no statistically significant, except for the constant.

dependent variables, even in the case of the random effects' model" (pp. 764). This suggests that the estimation method that I am using is inconsistent with this theoretical model.

Table 6: Results for the Tobit random-effects model: Ashley et al. (2010) specification

Variables	Model 3	Model 4	Model 5	Model 6	Model 7
Constant	-0.206***	-0.199*	0.268**	-0.122**	0.360***
	(0.048)	(0.092)	(0.101)	(0.047)	(0.059)
$C_{i,t-1}$	0.791***	3.920***		0.539***	
	(0.072)	(0.480)		(0.099)	
$C_{i,t-2}$	0.547***	0.238**		0.508***	
	(0.073)	(0.084)		(0.073)	
DFGpos: $\max\left[C_{i,t-1} - \overline{C}_{i,t-1}, 0\right]$		-3.617***	0.382***		
		(0.501)	(0.091)		
DFGneg: $\min\left[C_{i,t-1} - \overline{C}_{i,t-1}, 0\right]$		-2.210**	1.193*		
		(0.684)	(0.538)		
RR1	-0.005	-0.047	0.165		
	(0.052)	(0.096)	(0.131)		
RR3	0.070	0.040	0.538***		
	(0.057)	(0.110)	(0.137)		
FR5	0.089	0.072	0.524***		
	(0.059)	(0.110)	(0.136)		
DFGpos*RR1				0.001	0.004***
				(0.001)	(0.001)
DFGneg*RR1				-0.327	-0.248
				(1.062)	(1.044)
DFGpos*RR3				0.003**	0.008***
				(0.001)	(0.001)
DFGneg*RR3				-2.330	-3.114*
				(1.325)	(1.343)
DFGpos*FR5				0.004***	0.009***
				(0.001)	(0.001)
DFGneg*FR5				2.934**	2.130*
				(0.997)	(1.070)
LL	-372.535	-361.664	-444.826	-251.222	-417.644
Observations	640	640	720	640	720
Left-censored	88	88	95	88	95
Uncensored	334	334	379	334	379
Right-censored	218	218	246	218	246
Number of groups	80	80	80	80.000	80

Note: (1) The dependent variable is measured as fraction of endowment contributed. (2) Standard errors in parenthesis. (3) The selection of the number of lags to be included in the random effect models is made using the LR test, holding constant the number of observations considered in each model. (4) $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Another reason for the unexpected signs in some of the coefficients in Model 4 maybe the presence of feedback between the dependent variables and the two-period previous contribution decisions, i.e. these variables are only weakly exogenous, which can drive "the inconsistency of the RE [random effects] estimator. This inconsistency could be significant if the feedback [between dependent and independent] variables is strong and the panels are short, in which case would be better off using the Arellano and Bond (1991) or Keane and Runkle (1992) estimators" (pp. 3, Ashley (2010)). Then, maybe some variables in my model are not meeting the assumption of strong exogeneity because the independent variables DFGpos and DFGneg are constructed as functions of contribution decisions in the previous period, which lead to inconsistent estimators. However, the same variables are used in the two models estimated by Ashley et al. (2010) with two different data sets, but these authors got the expected signs for the coefficients in their two samples, with estimates for both models pretty close in sign and significance.

Therefore, there are some drawbacks to using of the random effects models when we incorporate lagged dependent variables, so I try to test the accuracy of this specification in comparison to a fixed effect model. Unfortunately, the Hausman specification test does not work for this model, because the statistic cannot be calculated due the variance-covariance matrix not being positive definite. However, I perform the test for the model without lagged variables and the test indicates reject the null hypothesis (p-value=0.000). Thus the fixed effect model is the only one consistent under the alternative hypothesis. Therefore, I should estimate a Tobit model with fixed effects, but this estimation is not possible as I have a short panel data with more cross sections (N=80) than time periods (T=10). Furthermore, the presence of invariant time regressors, i.e. the treatment effects, is also a factor against this type of model. Appendix K presents the results for a pooled Tobit model, which indicate that DFGpos and DFGneg help to explain the contribution decision. In particular, the positive and statistically significant sign for this both variables appears to indicate some sort of altruism. Furthermore, there is no evidence of warm glow (p-value=0.000) or conditional cooperation (p-value=0.633).

Due to the impossibility of performing the estimation of a Tobit fixed effect model, I present the results for its random effects version because allow the estimation of treatments effect even though those are inconsistent.

Result 7: The inclusion of lagged dependent variables affects the estimates in Model 4.

As I stated before, the reasons for this result can range from unexpected relationships between the regressors and the dependent variable to the use of a short panel of data. Although, the real cause for this result is not clear, possibly the estimation of a model that considers this type of dynamics *per se*, as the Arellano and Bond estimator, can be useful. However, the implementation of this type of model does not allow testing the hypothesis under analysis, because is not possible to recover the parameters of interest from a model in first differences. Furthermore, the variables DFGpos and DFGneg could still cause troubles, because they likely are correlated with the first order difference for the dependent variable that is considered as regressor for this model. Therefore, I discuss only the results for the random effect Tobit models without lagged contributions as dependent variables. Nonetheless, I include the results for the models with lagged dependent variable as regressors, but only for illustrative purposes.

Now I review the results in Table 6. The coefficients estimated in Model 5 for the constant and treatment effects are similar in magnitude and sign to those estimated in Model 1, but the former has a higher degree of correlation between the actual values for the dependent variable and its forecast, 0.597 vs. 0.387. Therefore, this model has a better adjustment.

Result 8: There is evidence of pure altruism, which means that "subjects take care about the level of provision of the public good" (pp. 18 in Ashley et al., 2010).

For Model 5 in Table 6, the deviation from the group positive (DFGpos) and negative (DFGneg) are statistically different from zero at the usual levels of significance, which support the results of the pooled model presented in Appendix K. The estimate for DFGpos is 0.382, meaning that if contributions of subject *i* are above the average of the others members of her group she increase her contributions in the next period. The previous finding is an indicator of the presence of altruism. The estimate for DFGneg is 1.193, indicating that if contributions of subject *i* are below the average she increases it in the next period. Therefore, the subjects are adjusting their contributions away from the group average. Given the previous results I test the presence of pure altruism, and I fail to reject this hypothesis (p-value=0.167).

The finding of altruism in the sample is not supported by the results of Noussair and Tucker (2007) and Ashley et al. (2010), because they found instead evidence of reciprocity. In particular, Noussair and Tucker found that "… the tendency to increase one's contributions in the next period in response to being below the average is not as strong as the tendency to reduce one's contributions in response to being above the average" (pp. 191), no matter whether they consider observability or not. Ashley et al. got a similar finding for their two data sets and for their two different econometric models: fixed and random effects. The difference among their and mine results may be caused by the frame used in my experiment.

The next step in the estimation process is to evaluate if there is a differentiated effect of DFGpos and DFGneg over the contribution decisions by treatment. Model 7 in Table 6 takes account of these, and the inclusion of these terms improves the fit of the model, measured by the correlation between the actual and predicted contributions, which is now 0.642. For the three treatments the coefficient of DFGpos are positive and statistically significant, which means that if the contributions of an individual are above the group average, the subject increases her contributions in the next period, i.e. the contributions do not converge to the average of the other members of the group. However, the sign and significance for DFGneg depend upon the treatments. For RR1 this is not statistically significant (p-value=0.812), while for RR3 it is negative and statistically significant (p-value=0.020) and for FR5 it is positive and statistically significant (p-value=0.047).

Result 9: The effect of DFGpos and DFGneg on contributions varies by treatment. In particular, RR3 exhibits altruism and positive reciprocity at the same time.

The null hypothesis of equal coefficients for DFGpos and DFGneg is rejected for the three treatments (p-values<0.008), therefore there is evidence of a differentiated effect by treatment. Furthermore, for RR1 there is evidence of pure altruism (p-value=0.809), while for RR3 the coefficient of DFGneg is negative and statistically significant[20] (p-value=0.020), which indicates the presence of positive reciprocity; whereas for FR5 it is positive and statistically

[20] This result is supported by the findings of Noussair and Tucker (2007) and Ashley et al (2010). And it means that if the contributions of a subject are below than the group average, the subject increases it in the next period.

significant (p-value=0.047). The fact that the RR3 exhibits positive reciprocity and altruism at the same time may explain why contributions increase over time (as in Figure 7) and may attenuate the end-game effect. The reason for this is that both effects work in the same direction, i.e. increasing contributions when these are below or above the group average. The simultaneous presence of both reciprocity and altruism is consistent with the frame used in the experiment. However, this effect does not show up in the other treatments, which suggests there is an interaction between the frame and RR3. More research needs to be done into RR3, because this is the first time that this treatment is considered. In particular, in the future I should test the results for RR3 with a neutral frame.

The next step in the estimation process is to including the profit feedback variable, proposed by Ferraro and Vossler (2010). I used an alternative specification for this variable, because my sample lacks of variability for its components: the hill climber mechanism and the differential in earnings. More specifically, I cannot utilize this variable because there are many cases where it is zero. Instead, I use as feedback variable one-period lagged earnings, and I expect a positive sign for its estimate because an increase (decrease) in earnings in the previous period should increase (decrease) contributions in the current round. The reason for this is that previous earnings are an indicator of the group's decisions. If the subjects know that they are getting benefits from the decisions of their group, they should increase their contributions to increase their earnings in the next period. Unfortunately, I also had problems with this variable, and I was not able to run the model properly. This is probably due to the small size of my sample, especially because I have a short time-series for a relatively large number of cross-sections, or possibly due to causality problems between the contribution decisions and this variable.

Due to the problems with the estimation of the Ferrero and Vossler profit mechanism, I decide to include a feedback mechanism based in the information received by the subjects about other's decisions in the different treatments. In particular, equation (11) considers the inclusion of the group's earnings loss provoked by revelation of subjects' contributions in the previous period. This variable was created as an interaction term between $R_{i,t-1}$ ($R_{i,t-1}$ is equal to 1 if the subject's contributions are revealed in the previous round and zero in other case) and $GEL_{i,t-1}$, the information about the group's earnings loss in the previous period. In the case that a subject's contributions are not revealed, or if she contributes all her endowment, there is not any information feedback, because this interaction term takes on a value of zero. However, I expect if the subjects are revealed ($R_{i,t-1} = 1$) and they provoke a loss in the group's earnings ($GEL_{i,t-1} > 0$), the disclosure of information about their decisions should trigger the feeling of shame, driving them to increase their contributions to the group project account in the next period. Therefore, I expect a positive coefficient for this variable.

$$C_{i,t} = \alpha_0 + \sum_{j=1}^{p} \rho_j C_{i,t-p} + \lambda_1 DFGpos_{i,t} + \lambda_2 DFGneg_{i,t} + \theta_1 R_{i,t-1} * GEL_{i,t-1} + \alpha_1 RR1_{i,t} + \alpha_2 RR3_{i,t} + \alpha_3 FR5_{i,t} + \varepsilon_{i,t} \quad (11)$$

Table 7 presents the results for this model. In particular, Model 8 considers as regressors lagged contributions while Model 9 does not. The LR test between these two models leads me to reject the null hypothesis that the restrictions hold (p-value < 0.001) and go with the unrestricted model (Model 8). However, as I stated previously, the estimates for the model that considers lagged dependent variable do not have the expected signs, while the model without lags do. Then I examine in detail the results for the models of the last type, while those with lagged contributions are presented only as part of the estimation process.

Result 10: The group's earnings loss feedback mechanism does not affect the presence of pure altruism.

Table 7 presents the results for Model 9, the estimates for DFGpos and DFGneg are positive and statistically significant (p-values<0.100). To verify the hypothesis of pure altruism, I test the equality of these parameters finding evidence in favor of this hypothesis (p-value=0.240). Additionally, when these results are compared with those in Model 5 I find that the parameters for DFGpos and DFGneg are relatively similar. This supports the presence of pure altruism across different specifications.

Table 7: Results for the Tobit random-effects model for the contribution decisions: the effect of group's earning loss feedback

Variables	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13
Constant	-0.147	0.295**	-0.149	0.765***	0.189	0.435***
	(0.094)	(0.094)	(0.101)	(0.087)	(0.097)	(0.062)
$C_{i,t-1}$	3.532***		3.791***		0.134	
	(0.514)		(0.471)		(0.135)	
$C_{i,t-2}$	0.230**		0.240**		0.317***	
	(0.084)		(0.085)		(0.088)	
DFGpos	-3.261***	0.298**	-3.488***	0.195*		
	(0.529)	(0.092)	(0.495)	(0.091)		
DFGneg	-1.905**	1.108*	-2.222***	1.075*		
	(0.698)	(0.524)	(0.665)	(0.517)		
RR1	-0.007	0.216				
	(0.098)	(0.121)				
RR3	0.121	0.619***				
	(0.117)	(0.128)				
FR5	0.180	0.676***				
	(0.122)	(0.130)				
DFGpos*RR1					0.003*	0.004**
					(0.001)	(0.001)
DFGneg*RR1					-0.130	-0.119
					(1.128)	(1.034)
DFGpos*RR3					0.006***	0.007***
					(0.001)	(0.001)
DFGneg*RR3					-3.555*	-3.279*
					(1.441)	(1.406)
DFGpos*FR5					0.007***	0.009***
					(0.001)	(0.001)
DFGneg*FR5					1.073	1.049
					(1.064)	(1.038)
$R_{i,t-1} * GEL_{i,t-1}$	-0.248*	-0.557***				
	(0.121)	(0.109)				
$R_{i,t-1} * GEL_{i,t-1} * RR1$			-0.131	-0.124	-0.151	-0.135
			(0.160)	(0.142)	(0.161)	(0.143)
$R_{i,t-1} * GEL_{i,t-1} * RR3$			-0.014	-0.130	-0.333	-0.224
			(0.200)	(0.200)	(0.222)	(0.207)
$R_{i,t-1} * GEL_{i,t-1} * FR5$			-0.305	-1.375***	-0.761***	-0.838***
			(0.187)	(0.217)	(0.190)	(0.188)
LL	-359.540	-431.580	-360.735	-433.354	-363.079	-406.640
Observations	640	720	640	720	640	720
Left-censored	88	95	88	95	88	95
Uncensored	334	379	334	379	334	379
Right-censored	218	246	218	246	218	246
Number of groups	80	80	80	80	80	80

Note: (1) Depend variable $C_{i,t}$ is measured as fraction of endowment contributed. (2) Standard errors in parenthesis. (3) The selection of the number of lags to be included in the random effect models is made using the LR test, holding constant the number of observations in each model considered. (4) $^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Result 11: The effect of the group's earnings loss feedback mechanism is negative and statistically significant.

The coefficient associated to the feedback mechanism is -0.557 and it is statistically different from zero at the usual levels of significance. This means that when the contribution decisions of a subject are revealed, and she is causing losses to the group, she did not feel shame about it. Instead, she decreases her contributions in the next round. A possible explanation for this result can be the lack of variability in our sample, which is evident because 68.47% of the observations for this variable have a value of zero. However, this finding is consistent with Noussair and Tucker's result that contributions fall as time progress.

Result 12: The effect of RR3 and FR5 treatments on the contribution decisions is positive and not statistically different

As in Model 5, I find evidence that there are no statistical differences for the estimates for RR3 and FR5 (p-value=0.656). This means that for subjects, revealing information about the decisions of 3 persons or for the complete group has the same effect. This is a very useful result because this suggests that I do not need full disclosure of information in order to get its positive effect on contributions. Then, the question is to find the right number of people to reveal the information about their performance and the effect of this over the earnings of the others members of their group.

The last four models presented in the Table 7, Models 10 through 13, consider an interaction between the previous feedback mechanism and the treatments (RR1, RR3 or FR5), i.e. consider how the degree of revelation affects the contribution decisions. The next equation represents Model 10 while Model 12 expands DFGpos and DFGneg by considering interactions between them and the treatments[21].

$$\begin{aligned} C_{i,t} &= \alpha_0 + \sum_{j=1}^{p} \rho_j C_{i,t-p} + \lambda_1 DFGpos_{i,t} + \lambda_2 DFGneg_{i,t} + \alpha_1 RR1_{i,t} * R_{i,t-1} * EGL_{i,t-1} \\ &\quad + \alpha_2 RR3_{i,t} * R_{i,t-1} * EGL_{i,t-1} + \alpha_3 FR5_{i,t} * R_{i,t-1} * EGL_{i,t-1} + \varepsilon_{i,t} \end{aligned} \tag{11}$$

[21] As before, I present the extended versions for these models, i.e. including lagged dependent variables, but I omit the discussion about this models because some of the parameters estimated for them do not have the expect signs even though the size of the coefficients, in absolute value, are similar.

Result 13: The group's earnings loss feedback mechanism that considers the degree of revelation does not affect the presence of pure altruism.

In Model 11 (Table 7), the parameters for DFGpos and DFGneg are 0.195 and 1.075, both of them being statistically different from zero. And there is evidence of pure altruism for this model (p-value=0.120). Therefore, the effect of pure altruism is robust among specifications, and the size of the coefficients does not differ significantly between models. However, when I consider the effect of these variables in the different treatments, only RR1 and FR5 show evidence in favor of this hypothesis (p-values>0.300). Furthermore, I found evidence that the coefficient for DFGpos is positive, significant and equal for RR3 and FR5 (p-value=0.167), while for DFGneg is not statistically significant for RR1 and FR5. Therefore, the altruism derived from contributions over the average is equal for the RR3 and FR5 treatments.

Result 14: The effect of a group's earnings loss feedback mechanism is only statistically significant for FR5 treatment.

For Model 13 the group's earnings loss feedback is not statistically significant for RR1 and RR3 treatments (p-values>0.370); while it is negative and statistically significant for FR5 (p-values<0.0001). This means that the subjects in this treatment decrease their contributions when their contributions are revealed. The sign for this effect is counterintuitive, because it is expected that the feeling of shame due to the revelation of the group's earnings loss provoked by subjects decisions would trigger an increase in their contributions in the next period. However, this is consistent with contributions falling over time both in the FR5 treatment and in Noussair and Tucker's experiment. Moreover, this provides a clue to the observed differences between RR3 and FR5. Revelation does not seem to have the negative effect on future contributions that is observed when all contributions are revealed (FR5), when only the decisions of a subset of subjects are revealed.

CHAPTER 5

CONCLUSIONS

5.1 Discussion and Conclusion

The objective of this research is to examine the ability of revelation, in its different degrees, to enhance cooperation. My findings point out that the degree of revelation helps to reduce the decay in contributions over time. In particular, when I analyze the difference between the fraction of endowment contributed in the first and last period I find that contribution in the Baseline decayed 54.5%, while in the treatments with disclosure of information this decrease ranged from 23.9 to 38.9%, with RR3 the treatment with the lowest decrease in contributions. Therefore, these treatments together with the frame and feedback information used in my experiment were able to avoid a further decay of contributions in the last round. Thus, I conclude that revelation is able to increase contributions over time, in comparison with the baseline, in a simple controlled laboratory environment.

A second objective of this work is to compare the ability of different microeconometric specifications to model contribution decisions. With respect to this subject I can divide my findings in two parts. The first one considers models that do not take account of lagged contributions as independent variables. From these models there are different results. From Model 1 I learn that the treatments have a differentiated effect over contributions, but all of them increase contributions. However, the effect of RR3 and FR5 are statistically indistinguishable. When the time-dimension is incorporated in the analysis (Model 2), the differentiated effect of the treatments over the contribution decisions remains, but for the last time-interval there is no statistical difference between RR3 and FR5. The previous finding could mean that subjects consider the probability of being revealed in RR3 high enough to make them contribute as if their decisions are revealed with certainty (FR5). However, Noussair and Tucker (2007) provide evidence that the full revelation does not promote cooperation in their experiment. In this context I must highlight that my results are likely driven by the frame and feedback I used. Therefore, I think that these two variables are playing an important role to enhance cooperation. The impact of the framing in the results is clear when I consider the results of Barr (2001) and Lopez et al.

(2010). These authors develop framed field experiments which consider the RR1 treatment, and they found that revelation of one subject's decision increases contribution. Still, I can not distinguish how the interaction between the frame that they used and their subject pool affects their results.

Despite the good results for the previous models, I find that the treatments alone cannot explain completely the contribution decisions. In this context, it is important highlight the presence of altruism across all the models estimated, instead of the expected positive and negative reciprocity, which are present in the works of Noussair and Tucker (2007) and Ashley et al. (2010). Although I introduce the group earning' loss feedback mechanism there is evidence of the presence of altruism.

From the previous results, I can conclude that the use of revelation, in particular revealing information about 3 or 5 subjects in a group of 5, RR3 and RR5 respectively, increases contributions. Furthermore, I provide evidence that the effect between these two treatments is indistinguishable when I do not consider interaction terms between these and other variables of interest. For instance, Model 7 supports the presence of differences in the signs for DFGpos and DFGneg. In particular, for the RR3 treatment there is evidence of altruism and positive reciprocity, which can explain why contributions in this treatment do not decay as much as they do in the baseline. Then, this finding sustains the use of systems that provide incomplete information about the subjects' decisions instead of full information, which may be cost prohibitive. However, I need to point out that this result is conditional on the frame of the experiment and probably on the information being disclosed. Therefore, a next step is to investigate how revelation works in a context of 3 out 5 subjects' being revealed when there is no frame for the experiment and with different feedback information. Noussair and Tucker (2007), and Denant-Boemont et al. (2011) indicate that identification and information about the decisions alone does not positively affect the contribution decisions. But my results do not support the findings of Lopez et al. (2010), because in my experiment the effect of RR1 is not enough to increase contributions in relation with the baseline. Therefore, I could say that in a laboratory environment I require more information in order to enhance cooperation, while members of a community are able to increase contributions even though revelation is poor (RR1). Therefore, there are stronger requirements to enhance cooperation in environments that do not have the bonds that communities share.

The second category of models considers microeconometrics models with lagged contributions as dependent variables[22], which address the impact of previous decisions over actual contributions (Noussair and Tucker (2007), Ashley et al. (2010), Ferrero and Vossler (2010)). In general, for these models, I observed unexpected negative signs for the estimates for the effect of the treatments and the constant. At first sight the explanation for this result is the use of a random effects model to estimate specifications that included lagged dependent variables. Cameron and Trivedi (2006) indicate that the estimation process in these conditions generates inconsistent estimators, but Ashley et al. (2010) used the same technique in a similar microeconometric model obtaining the expected signs for their estimators. I think the difference between their results and mine is likely due to the presence of feedback between the dependent variable and the regressors beyond the effect of lagged contributions, which is causing the inconsistency of my estimators (Ashley (2010)). Furthermore, I consider that these results are also affected by the limited number of time series observations for each cross-section in my sample.

In terms of future research, I could work to improve the estimation method currently used. In this context, I can use a different approach to avoid the potential problems that can arise from the use of lagged dependent variable in random effects models. In this context, the next step should be oriented to use the Arellano and Bond (1991) or Keane and Runkle (1992) estimators. However, the problem with these estimation methods is their ability to recover the parameters of interest for the research. Also, I need to investigate more deeply how RR3 is affecting the contribution decisions. In particular, further research should consider whether the positive results of this treatment remain valid in a non-framed experiment. Additionally, it would be interesting to trying to verify the presence of altruism in the Lopez et al. experiment. In their work, they do not consider variables that take account of the difference between own and others' average contribution, i.e. DFGpos and DFGneg. Then, re-estimating the models proposed here with their

[22] We use the LR test to evaluate if the lagged contributions belong to these models, and for all of them we reject the null hypothesis of their restricted versions.

data should provide more insights about my results, especially because this can allow comparing equivalent treatments, their frame and shame with our baseline and RR1.

APPENDICES

APPENDIX A

INSTRUCTIONS FOR THE BASELINE TREATMENT

Introduction

This exercise is part of a project funded by the University of Massachusetts Amherst. The purpose is to understand how people make decisions, and the results of this study will be used only for academic purposes. All the earnings you make during this exercise, as well as the information you will give us, are strictly confidential. We will not reveal your final earnings to any of the other participants or to anyone else.

Today's exercise is different from other exercises we have run in the lab before. For that reason, any comments you might have heard about this exercise may not apply to what we are doing today. Therefore, please make your decisions based on the instructions that we are about to present. Please pay careful attention to these instructions so that you can make good decisions. The show up payment of $5.00 and your earnings from the game will be paid in cash at the end of the session.

Please remain seated and do not communicate with other participants. Anyone who breaks this rule will be excluded from the game and they will not be paid. At this point the session will end and the other people in the group will be paid their earnings to that point.

The Experiment

Today's exercise has a total of ***10*** rounds. After we finish the 10 rounds, I will calculate your earnings while you answer a questionnaire.

You will participate in a group of ***5*** people. You will earn money depending upon your decisions and the decisions of other members of your group. The money that you earn today is compensation for your time and for the effort that you put into making decisions.

During the exercise your earnings will be calculated in tokens. Each token will be converted to dollars at the following rate: ***one token is equal to four cents.***

At the end of the exercise, I will add the total amount of tokens you have earned during all the rounds. I will pay you the equivalent of your tokens earnings in dollars rounded down to the nearest $1.00 plus the show up payment of $5.00. The money will be paid to each one of you in cash at the end of the session.

At the beginning of each round, each participant will receive 25 tokens. With the 25 tokens you must decide how many tokens you want to keep for yourself, and how many tokens you want to contribute to the group project account. At the end of each round, you will have some earnings, which are result of two things:

1. The number of tokens that you keep for yourself.
2. Your share of the tokens from the group project account. These tokens are calculated as follow:

   The total of tokens contributed to the group project account by the 5 members of your group will be doubled and then divided evenly among them.

For example, suppose the total contribution from all group members is 60 tokens. After I double these 60 tokens, there will be 120 tokens. Then, I will divide these 120 tokens evenly among the 5 group members, so each person will receive 24 tokens from the group project account.

Remember, at the end of the exercise we will add the total amount of tokens earned during the 10 rounds, and for each token we will pay you $0.04.

Decision Process

In each round you will use a DECISION CARD. On the decision card you will write how many tokens you keep for yourself, and how many tokens you contribute to the group project account.

The participant number will be your identification during the exercise and is the same number at your desk. The round number will identify the round we are playing currently. Also, in each round you will provide us information about:

_ “Tokens I keep for myself”

_ “Tokens I contribute to the project”

Remember, you have 25 tokens in each round, and your decision is to choose how many tokens you want to keep for yourself and how many tokens you want to contribute to the group project account. Therefore the sum of “Tokens I keep for myself” plus “Tokens I contribute to the project” ***must be equal to 25***.

After all the members of your group have made and written down their decisions, I will collect the participant’s cards and calculate the group contribution to the project account. Then, I will announce the total contribution to the project, and each person’s share of the earnings from this account.

Please remember that communication between the participants is ***not allowed.*** Anyone who breaks this rule will be excluded from the game and they will not receive any payment. Furthermore, the game will be over and nobody will be able to play any more rounds and increase their earnings.

In addition to the decision cards, you will be working with a calculation sheet to keep a record of your decisions and the number of tokens you have earned in each round.

Now, we will play a practice round to demonstrate the decision card and the calculation sheet.

Practice round

The decisions that you make in this round will not affect your earnings today. Suppose that in the practice round everybody decides to keep 8 tokens. Please take the decision card and the calculation sheet with the word PRACTICE written in the participant number.

We will suppose that we are playing the first round. We decide to keep 8 tokens. Because each one of you decided to keep 8 tokens, your individual contribution to the project are 17 tokens (25-8).

Once you are done with your decisions, please leave the card facing down at your desk. I will collect your decision cards to calculate the total tokens contributed to the project. In this case, the total amount of tokens contributed to the project is 85 (17*5).

After I double the amount of tokens contributed to the project, there will be 170 (85*2). Then I will divide the 170 tokens among you in equal shares. Therefore, each of you will receive from the project 34 tokens (170/5).

In order to calculate your earnings for the round, you need add the columns B and E. Hence, your total earnings for the round should be 42 (8+34).

Remember that at the end of the real exercise, we will add the total amount of tokens that you earned during the game, and for each token that you earned we will give you $0.04.

Questions

1/. Suppose that you contribute 0 tokens to the group project and the other 4 people in your group contribute 12 tokens.

a) How many tokens are contributed to the group project? ____________________
b) How many tokens do you earn from contributions to the group project?

   ____
c) What are your total earnings? ____
d) What are the total earnings of the others members of your group?

   ____

2/. Suppose that you contribute 12 tokens to the group project and the other 4 people in your group contribute 12 tokens.

a) How many tokens are contributed to the group project? ____________________
b) How many tokens do you earn from contributions to the group project?

   ____
c) What are your total earnings? ____
d) What are the total earnings of the others members of your group?

   ____

3/. Suppose that you contribute 25 tokens to the group project and the other 4 people in your group contribute 12 tokens.

a) How many tokens are contributed to the group project? ____________________

b) How many tokens do you earn from contributions to the group project?
____

c) What are your total earnings? ____

d) What are the total earnings of the others members of your group?
____

Before we begin to play for real money, I would like to point something out. As you may notice, the earnings for the group are the highest when everybody contributes 25 tokens to the group project. If you decide to keep tokens for yourself, you can increase your individual earnings but you are reducing the earnings of the group.

APPENDIX B

INSTRUCTIONS FOR THE PARTIAL REVELATION (RR1) TREATMENT

Introduction

This exercise is part of a project funded by the University of Massachusetts Amherst. The purpose is to understand how people make decisions, and the results of this study will be used only for academic purposes. All the earnings you make during this exercise, as well as the information you will give us, are strictly confidential. We will not reveal your final earnings to any of the other participants or to anyone else.

Today's exercise is different from other exercises we have run in the lab before. For that reason, any comments you might have heard about this exercise may not apply to what we are doing today. Therefore, please make your decisions based on the instructions that we are about to present. Please pay careful attention to these instructions so that you can make good decisions. The show up payment of $5.00 and your earnings from the game will be paid in cash at the end of the session.

Please remain seated and do not communicate with other participants. Anyone who breaks this rule will be excluded from the game and they will not be paid. At this point the session will end and the other people in the group will be paid their earnings to that point.

The Experiment

Today's exercise has a total of ***10*** rounds. After we finish the 10 rounds, I will calculate your earnings while you answer a questionnaire.

You will participate in a group of ***5*** people. You will earn money depending upon your decisions and the decisions of other members of your group. The money that you earn today is compensation for your time and for the effort that you put into making decisions.

During the exercise your earnings will be calculated in tokens. Each token will be converted to dollars at the following rate: ***one token is equal to four cents.***

At the end of the exercise, I will add the total amount of tokens you have earned during all the rounds. I will pay you the equivalent of your tokens earnings in dollars rounded down to the nearest $1.00 plus the show up payment of $5.00. The money will be paid to each one of you in cash at the end of the session.

At the beginning of each round, each participant will receive 25 tokens. With the 25 tokens you must decide how many tokens you want to keep for yourself, and how many tokens you want to contribute to the group project account. At the end of each round, you will have some earnings, which are result of two things:

1. The number of tokens that you keep for yourself.
2. Your share of the tokens from the group project account. These tokens are calculated as follow:

The total of tokens contributed to the group project account by the 5 members of your group will be doubled and then divided evenly among them.

For example, suppose the total contribution from all group members is 60 tokens. After I double these 60 tokens, there will be 120 tokens. Then, I will divide these 120 tokens evenly among the 5 group members, so each person will receive 24 tokens from the group project account.

Remember, at the end of the exercise we will add the total amount of tokens earned during the 10 rounds, and for each token we will pay you $0.04.

Decision Process

In each round you will use a DECISION CARD. On the decision card you will write how many tokens you keep for yourself, and how many tokens you contribute to the group project account.

The participant number will be your identification during the exercise and is the same number at your desk. The round number will identify the round we are playing currently. Also, in each round you will provide us information about:

_ “Tokens I keep for myself”

_ “Tokens I contribute to the project”

Remember, you have 25 tokens in each round, and your decision is to choose how many tokens you want to keep for yourself and how many tokens you want to contribute to the group project account. Therefore the sum of “Tokens I keep for myself” plus “Tokens I contribute to the project” ***must be equal to 25***.

After all the members of your group have made and written down their decisions, I will collect the participant’s cards and calculate the group contribution to the project account. Then, I will announce the total contribution to the project, and each person’s share of the earnings from this account.

Please remember that communication between the participants is ***not allowed.*** Anyone who breaks this rule will be excluded from the game and they will not receive any payment. Furthermore, the game will be over and nobody will be able to play any more rounds and increase their earnings.

In addition to the decision cards, you will be working with a calculation sheet to keep a record of your decisions and the number of tokens you have earned in each round.

Now, we will play a practice round to demonstrate the decision card and the calculation sheet.

Practice round

The decisions that you make in this round will not affect your earnings today. Suppose that in the practice round everybody decides to keep ***8 tokens***. Please take from your folder the decision card and the calculation sheet with the word PRACTICE written in the participant number.

We will suppose that we are playing the first round. We decide to keep 8 tokens. Because each one of you decided to keep 8 tokens, your individual contribution to the project are 17 tokens (25-8).

Once you are done with your decisions, please leave the card facing down at your desk. I will collect your decision cards to calculate the total tokens contributed to the project. In this case, the total amount of tokens contributed to the project is 85 (17*5).

After I double the amount of tokens contributed to the project, there will be 170 (85*2). Then I will divide the 170 tokens among you in equal shares. Therefore, each of you will receive from the project 34 tokens (170/5).

In order to calculate your earnings for the round, you need add the columns B and E. Hence, your total earnings for the round should be 42 (8+34).

After you make your decisions and handed your decision card to me, I will randomly select ***one person***. Everyone will be read an announcement with a reminder of how the decision of this person affected the earnings of the group. Then, in the column G of your calculation sheet, you will write if you were randomly selected in the round.

We will decide who will be randomly selected as follow. I will introduce 5 balls with the number associated to each one of you in this bag. This means that in each round each player has one chance in five to be selected. The selected ball will be returned to the bag, then if you are selected in one round, you may also be selected in another round. Therefore, you could be selected more than once during the experiment. Also it is possible that you never will be selected.

Remember that at the end of the real exercise, we will add the total amount of tokens that you earned during the game, and for each token that you earned we will give you $0.04.

Questions

1/. Suppose that you contribute 0 tokens to the group project and the other 4 people in your group contribute 12 tokens.

a) How many tokens are contributed to the group project? ______________________

b) How many tokens do you earn from contributions to the group project?

____

c) What are your total earnings? ____

d) What are the total earnings of the others members of your group?

____

e) What are the losses to the group because you did not contribute all of your tokens?

____

2/. Suppose that you contribute 12 tokens to the group project and the other 4 people in your group contribute 12 tokens.

a) How many tokens are contributed to the group project? ______________________

b) How many tokens do you earn from contributions to the group project?

____

c) What are your total earnings? ____

d) What are the total earnings of the others members of your group?

____

e) What are the losses to the group because you did not contribute all of your tokens?

____

3/. Suppose that you contribute 25 tokens to the group project and the other 4 people in your group contribute 12 tokens.

a) How many tokens are contributed to the group project? ______________________

b) How many tokens do you earn from contributions to the group project?

____

c) What are your total earnings? ____

d) What are the total earnings of the others members of your group?

____

e) What are the losses to the group because you did not contribute all of your tokens?

____

Before we begin to play for real money, I would like to point something out. As you may notice, the earnings for the group are the highest when everybody contributes 25 tokens to the group project. If you decide to keep tokens for yourself, you can increase your individual earnings but you are reducing the earnings of the group.

Remember, you have 25 tokens in each round, and your decision is to choose how many tokens you want to keep for yourself and how many tokens you want to contribute to the group project account.

APPENDIX C

INSTRUCTIONS FOR THE RANDOM REVELATION (RR3) TREATMENT

Introduction

This exercise is part of a project funded by the University of Massachusetts Amherst. The purpose is to understand how people make decisions, and the results of this study will be used only for academic purposes. All the earnings you make during this exercise, as well as the information you will give us, are strictly confidential. We will not reveal your final earnings to any of the other participants or to anyone else.

Today's exercise is different from other exercises we have run in the lab before. For that reason, any comments you might have heard about this exercise may not apply to what we are doing today. Therefore, please make your decisions based on the instructions that we are about to present. Please pay careful attention to these instructions so that you can make good decisions. The show up payment of $5.00 and your earnings from the game will be paid in cash at the end of the session.

Please remain seated and do not communicate with other participants. Anyone who breaks this rule will be excluded from the game and they will not be paid. At this point the session will end and the other people in the group will be paid their earnings to that point.

The Experiment

Today's exercise has a total of ***10*** rounds. After we finish the 10 rounds, I will calculate your earnings while you answer a questionnaire.

You will participate in a group of ***5*** people. You will earn money depending upon your decisions and the decisions of other members of your group. The money that you earn today is compensation for your time and for the effort that you put into making decisions.

During the exercise your earnings will be calculated in tokens. Each token will be converted to dollars at the following rate: ***one token is equal to four cents.***

At the end of the exercise, I will add the total amount of tokens you have earned during all the rounds. I will pay you the equivalent of your tokens earnings in dollars rounded down to the nearest $1.00 plus the show up payment of $5.00. The money will be paid to each one of you in cash at the end of the session.

At the beginning of each round, each participant will receive 25 tokens. With the 25 tokens you must decide how many tokens you want to keep for yourself, and how many tokens you want to contribute to the group project account. At the end of each round, you will have some earnings, which are result of two things:

1. The number of tokens that you keep for yourself.
2. Your share of the tokens from the group project account. These tokens are calculated as follow:

The total of tokens contributed to the group project account by the 5 members of your group will be doubled and then divided evenly among them.

For example, suppose the total contribution from all group members is 60 tokens. After I double these 60 tokens, there will be 120 tokens. Then, I will divide these 120 tokens evenly among the 5 group members, so each person will receive 24 tokens from the group project account.

Remember, at the end of the exercise we will add the total amount of tokens earned during the 10 rounds, and for each token we will pay you $0.04.

Decision Process

In each round you will use a DECISION CARD. On the decision card you will write how many tokens you keep for yourself, and how many tokens you contribute to the group project account.

The participant number will be your identification during the exercise and is the same number at your desk. The round number will identify the round we are playing currently. Also, in each round you will provide us information about:

_ "Tokens I keep for myself"

_ "Tokens I contribute to the project"

Remember, you have 25 tokens in each round, and your decision is to choose how many tokens you want to keep for yourself and how many tokens you want to contribute to the group project account. Therefore the sum of "Tokens I keep for myself" plus "Tokens I contribute to the project" ***must be equal to 25***.

After all the members of your group have made and written down their decisions, I will collect the participant's cards and calculate the group contribution to the project account. Then, I will announce the total contribution to the project, and each person's share of the earnings from this account.

Please remember that communication between the participants is ***not allowed.*** Anyone who breaks this rule will be excluded from the game and they will not receive any payment. Furthermore, the game will be over and nobody will be able to play any more rounds and increase their earnings.

In addition to the decision cards, you will be working with a calculation sheet to keep a record of your decisions and the number of tokens you have earned in each round.

Now, we will play a practice round to demonstrate the decision card and the calculation sheet.

Practice round

The decisions that you make in this round will not affect your earnings today. Suppose that in the practice round everybody decides to keep ***8 tokens***. Please take from your folder the decision card and the calculation sheet with the word PRACTICE written in the participant number.

We will suppose that we are playing the first round. We decide to keep 8 tokens. Because each one of you decided to keep 8 tokens, your individual contribution to the project are 17 tokens (25-8).

Once you are done with your decisions, please leave the card facing down at your desk. I will collect your decision cards to calculate the total tokens contributed to the project. In this case, the total amount of tokens contributed to the project is 85 (17*5).

After I double the amount of tokens contributed to the project, there will be 170 (85*2). Then I will divide the 170 tokens among you in equal shares. Therefore, each of you will receive from the project 34 tokens (170/5).

In order to calculate your earnings for the round, you need add the columns B and E. Hence, your total earnings for the round should be 42 (8+34).

After you make your decisions and handed your decision card to me, I will randomly select ***three persons***. Everyone will be read an announcement with a reminder of how the decisions of these people affected the earnings of the group. Then, in the column G of your calculation sheet, you will write if you were randomly selected in the round.

We will decide who will be randomly selected as follow. I will introduce 5 balls with the number associated to each one of you in this bag. This means that in each round each player has three chances in five to be selected. The selected balls will be returned to the bag, then if you are selected in one round, you may also be selected in another round. Therefore, you could be selected more than once during the experiment. Also it is possible that you never will be selected.

Remember that at the end of the real exercise, we will add the total amount of tokens that you earned during the game, and for each token that you earned we will give you $0.04.

Questions

1/. Suppose that you contribute 0 tokens to the group project and the other 4 people in your group contribute 12 tokens.

a) How many tokens are contributed to the group project? ______________________

b) How many tokens do you earn from contributions to the group project?

____

c) What are your total earnings? ____

d) What are the total earnings of the others members of your group?

____

e) What are the losses to the group because you did not contribute all of your tokens?

____

2/. Suppose that you contribute 12 tokens to the group project and the other 4 people in your group contribute 12 tokens.

a) How many tokens are contributed to the group project? ______________________

b) How many tokens do you earn from contributions to the group project?

____

c) What are your total earnings? ____

d) What are the total earnings of the others members of your group?

____

e) What are the losses to the group because you did not contribute all of your tokens?

____

3/. Suppose that you contribute 25 tokens to the group project and the other 4 people in your group contribute 12 tokens.

a) How many tokens are contributed to the group project? ______________________

b) How many tokens do you earn from contributions to the group project?

____

c) What are your total earnings? ____

d) What are the total earnings of the others members of your group?

____

e) What are the losses to the group because you did not contribute all of your tokens?

____

Before we begin to play for real money, I would like to point something out. As you may notice, the earnings for the group are the highest when everybody contributes 25 tokens to the group project. If you decide to keep tokens for yourself, you can increase your individual earnings but you are reducing the earnings of the group.

Remember, you have 25 tokens in each round, and your decision is to choose how many tokens you want to keep for yourself and how many tokens you want to contribute to the group project account.

APPENDIX D

INSTRUCTIONS FOR THE FULL REVELATION (FR3) TREATMENT

Introduction

This exercise is part of a project funded by the University of Massachusetts Amherst. The purpose is to understand how people make decisions, and the results of this study will be used only for academic purposes. All the earnings you make during this exercise, as well as the information you will give us, are strictly confidential. We will not reveal your final earnings to any of the other participants or to anyone else.

Today's exercise is different from other exercises we have run in the lab before. For that reason, any comments you might have heard about this exercise may not apply to what we are doing today. Therefore, please make your decisions based on the instructions that we are about to present. Please pay careful attention to these instructions so that you can make good decisions. The show up payment of $5.00 and your earnings from the game will be paid in cash at the end of the session.

Please remain seated and do not communicate with other participants. Anyone who breaks this rule will be excluded from the game and they will not be paid. At this point the session will end and the other people in the group will be paid their earnings to that point.

The Experiment

Today's exercise has a total of ***10*** rounds. After we finish the 10 rounds, I will calculate your earnings while you answer a questionnaire.

You will participate in a group of ***5*** people. You will earn money depending upon your decisions and the decisions of other members of your group. The money that you earn today is compensation for your time and for the effort that you put into making decisions.

During the exercise your earnings will be calculated in tokens. Each token will be converted to dollars at the following rate: ***one token is equal to four cents.***

At the end of the exercise, I will add the total amount of tokens you have earned during all the rounds. I will pay you the equivalent of your tokens earnings in dollars rounded down to the nearest $1.00 plus the show up payment of $5.00. The money will be paid to each one of you in cash at the end of the session.

At the beginning of each round, each participant will receive 25 tokens. With the 25 tokens you must decide how many tokens you want to keep for yourself, and how many tokens you want to contribute to the group project account. At the end of each round, you will have some earnings, which are result of two things:

1. The number of tokens that you keep for yourself.
2. Your share of the tokens from the group project account. These tokens are calculated as follow:

   The total of tokens contributed to the group project account by the 5 members of your group will be doubled and then divided evenly among them.

For example, suppose the total contribution from all group members is 60 tokens. After I double these 60 tokens, there will be 120 tokens. Then, I will divide these 120 tokens evenly among the 5 group members, so each person will receive 24 tokens from the group project account.

Remember, at the end of the exercise we will add the total amount of tokens earned during the 10 rounds, and for each token we will pay you $0.04.

Decision Process

In each round you will use a DECISION CARD. On the decision card you will write how many tokens you keep for yourself, and how many tokens you contribute to the group project account.

The participant number will be your identification during the exercise and is the same number at your desk. The round number will identify the round we are playing currently. Also, in each round you will provide us information about:

_ "Tokens I keep for myself"

_ "Tokens I contribute to the project"

Remember, you have 25 tokens in each round, and your decision is to choose how many tokens you want to keep for yourself and how many tokens you want to contribute to the group project account. Therefore the sum of "Tokens I keep for myself" plus "Tokens I contribute to the project" ***must be equal to 25***.

After all the members of your group have made and written down their decisions, I will collect the participant's cards and calculate the group contribution to the project account. Then, I will announce the total contribution to the project, and each person's share of the earnings from this account.

Please remember that communication between the participants is ***not allowed.*** Anyone who breaks this rule will be excluded from the game and they will not receive any payment. Furthermore, the game will be over and nobody will be able to play any more rounds and increase their earnings.

In addition to the decision cards, you will be working with a calculation sheet to keep a record of your decisions and the number of tokens you have earned in each round.

Now, we will play a practice round to demonstrate the decision card and the calculation sheet.

Practice round

The decisions that you make in this round will not affect your earnings today. Suppose that in the practice round everybody decides to keep ***8 tokens***. Please take from your folder the decision card and the calculation sheet with the word PRACTICE written in the participant number.

We will suppose that we are playing the first round. We decide to keep 8 tokens. Because each one of you decided to keep 8 tokens, your individual contribution to the project are 17 tokens (25-8).

Once you are done with your decisions, please leave the card facing down at your desk. I will collect your decision cards to calculate the total tokens contributed to the project. In this case, the total amount of tokens contributed to the project is 85 (17*5).

After I double the amount of tokens contributed to the project, there will be 170 (85*2). Then I will divide the 170 tokens among you in equal shares. Therefore, each of you will receive from the project 34 tokens (170/5).

In order to calculate your earnings for the round, you need add the columns B and E. Hence, your total earnings for the round should be 42 (8+34).

Reminder

After you make your decisions and handed your decision card to me. Everyone will be read an announcement with a reminder of how their decisions affected the earnings of the group.

Remember that at the end of the real exercise, we will add the total amount of tokens that you earned during the game, and for each token that you earned we will give you $0.04.

Questions

1/. Suppose that you contribute 0 tokens to the group project and the other 4 people in your group contribute 12 tokens.

a) How many tokens are contributed to the group project? ______________________

b) How many tokens do you earn from contributions to the group project?

   ____

c) What are your total earnings? ____

d) What are the total earnings of the others members of your group?

   ____

e) What are the losses to the group because you did not contribute all of your tokens?

   ____

2/. Suppose that you contribute 12 tokens to the group project and the other 4 people in your group contribute 12 tokens.

a) How many tokens are contributed to the group project? ______________________

b) How many tokens do you earn from contributions to the group project?

____

c) What are your total earnings? ____

d) What are the total earnings of the others members of your group?

____

e) What are the losses to the group because you did not contribute all of your tokens?

____

3/. Suppose that you contribute 25 tokens to the group project and the other 4 people in your group contribute 12 tokens.

a) How many tokens are contributed to the group project? ______________________

b) How many tokens do you earn from contributions to the group project?

____

c) What are your total earnings? ____

d) What are the total earnings of the others members of your group?

____

e) What are the losses to the group because you did not contribute all of your tokens?

____

Before we begin to play for real money, I would like to point something out. As you may notice, the earnings for the group are the highest when everybody contributes 25 tokens to the group project. If you decide to keep tokens for yourself, you can increase your individual earnings but you are reducing the earnings of the group.

Remember, you have 25 tokens in each round, and your decision is to choose how many tokens you want to keep for yourself and how many tokens you want to contribute to the group project account.

APPENDIX E

QUESTIONNAIRE

Participant number ___________

QUESTIONNAIRE

Please, answer the following questions about you. You may skip any questions you do not feel comfortable answering. Recall that the results of this study will only be used for academic purposes. Your answers are anonymous, confidential and these will not be published at an individual level. The answers that you provide us are neither wrong nor right.

First Part. Personal information

Your personal characteristics are very important, because they help us to understand the decision that you made. Remember that all the information that you give to us is confidential and this will not be published at an individual level, therefore your identity is not compromised.

1. How old are you? ______ years.
2. What is your gender? (Please mark with a X) Male ____ Female ____
3. Which score did you obtain in the mathematical part of the SAT's? (Please circle the alternative)
   a. less than 600
   b. between 600 and 700
   c. more than 700
4. What career are you studying? ______________________________
5. What semester are you in? ______________________________
6. How many Economics courses have you taken? __________________ courses
7. Do you belong to any religion? (Circle) Yes No

8. Consider the following definitions:

Active member: person who participate in the organization more than once a month.

Inactive member: person who participate in the organization only for special occasions or once a year.

Non member: person who is not affiliate to the organization or participate in it less than once a year.

Please, for each voluntary organization indicate if you are an active, inactive or non member. (Mark with an X)

	Active Member	Inactive member	Non Member
a. Church or other religious organization			
b. Sport or recreation organization			
c. Art, music or educative organization			
d. Humanitarian organization or charity			
e. Other (Which?) ____________________			

<u>Second Part.</u>

*Please, consider a **scale from 1 to 5**, with 1 no trust at all and 5 absolute trust, and indicate in the following table how much do you trust in the following organizations or groups.*

9. Please, indicate your level of trust.

Groups	Level of trust (from 1 to 5)
People in general	
Your family	
Other students	
Local government	
University Professors	
Strangers	
Police	
News papers	
Television networks	
National government	

10. Again, consider a ***scale from 1 to 5***, but now you need indicate the level of trust that you believe people have in you. With 1 not reliable and 5 absolutely reliable. (Mark a X)

1 (Not reliable)	2	3	4	5 (Absolutely reliable)

Third Part. About the experiment

11. How many times have you participated in an experiment like this before? (Please circle the alternative)
    a. Never, this is my first time
    b. Once
    c. Twice
    d. Between three and five times.
    e. More than five times.
12. Do you know others participants in your group? (Circle) No Yes
13. If your answer is YES in question 12, please tell us what participants you know? (Please circle ALL the alternatives that apply)
    a. Participant No.1
    b. Participant No.2
    c. Participant No.3
    d. Participant No.4
    e. Participant No.5
14. In general, did you have any trouble responding to the questions in the experiment? (Circle) No Yes
15. If your answer is YES in question 14, please tell us about the problems that you faced. If your answer was NO, please go to question 16.

    ____
16. What do you think is the purpose of this experiment?

17. Do you have any other questions or comments about the experiment? If not, you can go to question 18.

____

18. If you would like to know the results from the study; you can give us your email address to submit you at the end of the study an electronic copy of this. This is up to you, so you can leave this question in blank.

Please, remain quiet and wait in your seat until the other participants finish the questionnaire. At this time we are calculating your earnings from the experiment. When we conclude this process we will call the participants, one by one, using the participant number given to each of you. Please, be patient and wait for your turn.

Thank you for participate in the session.

APPENDIX F

CHARACTERISTICS OF THE SUBJECT POOL

Subjects characteristics	**Mean**	**Standard Deviation**	**Minimum**	**Maximum**
Age	22.29	6.35	18	58
Males	0.525	0.500	0	1
Undergraduates	0.875	0.331	0	1
Subjects without studies in Economics	27.50%			
Subject's field				
Undecided	12.50%			
Natural Sciences	16.25%			
Social Sciences	25.00%			
Economics	32.50%			
Sciences	13.75%			
Religious person	0.450	0.498	0	1
Level of trust [1]				
Family	4.738	0.565	3	5
Students	3.050	0.879	1	5
People *	2.759	0.918	1	4
Strangers	2.300	0.887	1	4
Police *	3.240	0.984	1	5
Local Government *	2.671	0.938	1	5
National Government **	2.641	0.906	1	5
University Professors *	3.823	0.792	2	5
Newspapers *	2.620	0.847	1	5
Television *	2.266	0.823	1	4
Self definition for reliability	4.138	0.565	3	5
People know other people in the session	0.175	0.380	0	1
First experiment	0.575	0.495	0	1

[1] The level of trust is measured by a scale from one to five, being 1 no trust and 5 absolute trust.

* Indicates that these values were calculated in base to 790 observations, while ** indicates that were used 780 observations.

APPENDIX G

DESCRIPTIVE STATISTICS FOR THE VARIABLES USED IN THE ESTIMATION PROCESS

Variable	N	Mean	SD	Min	Max
Average contributions ($C_{i,t}$)	800	15.553	9.091	0	25
Deviation from the group positive (DFGpos)	720	0.494	0.301	0	0.99
DFGpos in the B	180	0.349	0.306	0	0.95
DFGpos in the RR1	180	0.438	0.297	0	0.95
DFGpos in the RR3	180	0.595	0.232	0	0.94
DFGpos in the FR5	180	0.594	0.288	0	0.99
Deviation from the group negative (DFGneg)	720	-0.014	0.043	-0.25	0
DFGneg in the B	180	-0.024	0.051	-0.21	0
DFGneg in the RR1	180	-0.011	0.035	-0.19	0
DFGneg in the RR3	180	-0.007	0.033	-0.20	0
DFGneg in the FR5	180	-0.016	0.049	-0.25	0
Initial contribution ($C_{i,1}$)	80	18.112	7.236	0	25
$C_{i,1}$ in the B	20	17.15	7.862	0	25
$C_{i,1}$ in the RR1	20	16.05	7.708	0	25
$C_{i,1}$ in the RR3	20	19.70	6.165	8	25
$C_{i,1}$ in the FR5	20	19.55	6.939	0	25
Final contribution ($C_{i,10}$)	80	11.325	9.981	0	25
$C_{i,10}$ in the B	20	7.80	8.154	0	25
$C_{i,10}$ in the RR1	20	10.55	9.693	0	25
$C_{i,10}$ in the RR3	20	15.00	10.382	0	25
$C_{i,10}$ in the FR5	20	11.95	10.846	0	25
Revelation*Group Earning Loss ($R_{i,t-1} * GEL_{i,t-1}$)	720	0.110	0.204	0	1
$R_{i,t-1} * GEL_{i,t-1}$ in the B	180	0	0	0	0
$R_{i,t-1} * GEL_{i,t-1}$ in the RR1	180	0.081	0.219	0	1
$R_{i,t-1} * GEL_{i,t-1}$ in the RR3	180	0.123	0.164	0	0.54
$R_{i,t-1} * GEL_{i,t-1}$ in the FR5	180	0.237	0.253	0	0.76

APPENDIX H

RESULTS FOR ORDINARY LEAST SQUARES ESTIMATION METHOD

Table H-1: Results for contributions measured as the average by group.

	Model A.1	**Model A.2**	**Model B.1**	**Model B.2**	**Model C.1**	**Model C.2**
Dependent Variable	Average contribution	Average fraction of endowment contributed	Average contribution	Average fraction of endowment contributed	Average contribution	Average fraction of endowment contributed
Variables	Coefficients					
Constant	10.550***	0.422***				
	(2.349)	(0.094)				
RR1	3.370	0.135			3.370	0.135
	(3.322)	(0.133)			(3.322)	(0.133)
RR3	8.645*	0.346*			8.645*	0.346*
	(3.322)	(0.133)			(3.322)	(0.133)
FR5	7.995*	0.320*			7.995*	0.320*
	(3.322)	(0.133)			(3.322)	(0.133)
Time			2.828***	0.113***	1.918***	0.077***
			(0.253)	(0.010)	(0.427)	(0.017)
N	16	16	16	16	16	16
R^2	0.430	0.430	0.893	0.893	0.939	0.939
$\overline{R}^2$	0.287	0.287	0.886	0.886	0.919	0.919
F-test	3.015	3.015	124.961	124.961	46.089	46.089

Note: (1) Standard errors in parenthesis. (2) $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table H-2: Results for contributions measured as the average by individual.

	Model D.1	**Model D.2**
Dependent Variable	Contributions	Fraction of endowment contributed
Variables	Coefficients	
Constant	10.550***	0.422***
	(0.846)	(0.034)
RR1	3.370	0.135
	(2.791)	(0.112)
RR3	8.645***	0.346***
	(1.978)	(0.079)
FR5	7.995*	0.320*
	(2.844)	(0.114)
N	80	80
R^2	0.266	0.266
F-test	8.167	8.167

Note: (1) Standard errors in parenthesis. (2) $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

APPENDIX I

RESULTS FOR ORDINARY LEAST SQUARES ESTIMATION METHOD WITH DEMOGRAPHICS CHARACTERISTICS

	Model E.1	Model E.2
Dependent Variable	**Average contributions by individual**	**Average fraction of endowment contributed by individual**
Variable	Coefficients	
Constant	3.471	0.139
	(10.677)	(0.427)
RR1	4.028	0.161
	(2.737)	(0.109)
RR3	8.053***	0.322***
	(1.588)	(0.064)
FR5	7.803*	0.312*
	(3.254)	(0.130)
Age	-0.140	-0.006
	(0.093)	(0.004)
Sex (male=1, female=0)	-1.037	-0.041
	(1.440)	(0.058)
Studies (undergrad=1, graduate=0)	2.431	0.097
	(3.093)	(0.124)
Average level of trust [1]	1.321	0.053
	(1.536)	(0.061)
Trustworthy	0.945	0.038
	(1.865)	(0.075)
Low experience [2]	0.138	0.006
	(1.827)	(0.073)
High experience [2]	3.445	0.138
	(2.983)	(0.119)
Know other people in her/his group [3]	1.497	0.060
	(1.830)	(0.073)
R-squared	0.319	0.319
Adjusted R-squared	0.203	0.203
Observations	77	77

[1] For this variable we consider those observations without missing values.

[2] These variables represent the level of experience that the participants have at the moment of the experiment. The default level is no experience at all.

[3] This is a dummy variable which takes the value of 1 if the subjects know other individual in their group.

Notes: (1) Standard errors in parenthesis; (2) * 10 percent significant level, ** 5 percent significant level, *** 1 percent significant level

APPENDIX J

EFFECT OF TIME OVER THE CONTRIBUTION DECISIONS

Data	Model F All Sample	Model F.1 Baseline	Model F.2 RR1	Model F.3 RR3	Model F.4 FR5
Constant	0.885***	0.763***	0.687***	1.031***	1.089***
	(0.078)	(0.105)	(0.112)	(0.147)	(0.258)
d2	-0.021	-0.336**	0.018	0.155	0.256
	(0.066)	(0.112)	(0.101)	(0.132)	(0.213)
d3	0.027	-0.294**	0.031	0.115	0.605*
	(0.067)	(0.111)	(0.101)	(0.130)	(0.244)
d4	-0.052	-0.342**	-0.101	0.008	0.592*
	(0.067)	(0.110)	(0.101)	(0.129)	(0.238)
d5	-0.068	-0.419***	-0.076	0.044	0.536*
	(0.067)	(0.111)	(0.101)	(0.131)	(0.241)
d6	-0.146*	-0.374***	-0.088	-0.101	0.116
	(0.066)	(0.110)	(0.101)	(0.128)	(0.220)
d7	-0.119	-0.370***	-0.087	0.061	0.042
	(0.067)	(0.111)	(0.102)	(0.130)	(0.216)
d8	-0.168*	-0.443***	-0.139	0.063	-0.029
	(0.067)	(0.112)	(0.103)	(0.130)	(0.213)
d9	-0.302***	-0.432***	-0.243*	-0.163	-0.370
	(0.067)	(0.111)	(0.104)	(0.128)	(0.207)
d10	-0.405***	-0.481***	-0.315**	-0.289*	-0.567**
	(0.066)	(0.111)	(0.103)	(0.127)	(0.204)
LL	-505.457	-118.615	-108.228	-104.103	-121.368
Observations	800	200	200	200	200
Left-censored	100	39	26	8	27
Uncensored	423	137	131	99	56
Right-censored	277	24	43	93	117
Number of groups	80.000	20.000	20.000	20.000	20.000

Note: (1) The dependent variable is measured as fraction of endowment contributed. (2) Standard errors in parenthesis. (3) * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

APPENDIX K

POOLED TOBIT MODEL

Variables	Model G
Constant	0.025
	(0.051)
DFGpos: $\max\left[C_{i,t-1} - \overline{C}_{i,t-1}, 0\right]$	1.035***
	(0.082)
DFGneg: $\min\left[C_{i,t-1} - \overline{C}_{i,t-1}, 0\right]$	1.311*
	(0.533)
RR1	0.110*
	(0.051)
RR3	0.310***
	(0.055)
FR5	0.334***
	(0.057)
LL	-494.828
Pseudo R^2	0.284
Observations	720
Left-censored	95
Uncensored	379
Right-censored	246

Note: (1) The dependent variable is measured as fraction of endowment contributed. (2) Standard errors in parentheses. (3) * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

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