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# Promoting socially desirable behaviors: experimental comparison of the procedures of persuasion and commitment \*

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## **Abstract**

In a series of experiments, we test the relative efficiency of persuasion and commitment schemes to increase and sustain contribution levels in a Voluntary Contribution Game. The design allows to compare a baseline consisting of a repeated public good game to, respectively, four manipulation treatments relying on: an information strategy, a low commitment strategy, a high commitment strategy and a promise strategy. We confirm the advantages of psychologically orientated policies as they increase the overall level of contribution and for some, that is commitment and promises, question the decreasing trend traditionally observed in long term contributions to public goods.

JEL codes: C91, D91, H41

*Keywords: Experiment, Persuasion, Commitment, Voluntary Contribution Mechanism*

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# 1 Introduction

The study of the design of public policies takes on increased importance under the combined effect of the necessary rationalization of their costs and the observation of differential efficiency between theoretical predictions and final outcome. In recent years, the use of incentives in behavioral interventions has become more popular. These interventions are programs that help people to change their behaviors; i.e. to increase pro-environmental behavior or school attendance, to improve health outcomes or to motivate employees. However extrinsic monetary incentives have been shown to sometimes backfire and crowd-out intrinsic motivations that may be important to produce desired behaviors (Gneezy et al., 2011). This has led to an increasing use of non-monetary incentives such as framing, nudges or other legal instruments.

In this paper, we use lab experiments to look at the comparative effects of persuasion and commitment schemes to promote contribution in social dilemma situations. We use a Voluntary Contribution Mechanism (VCM) played in a repeatedly finite environment to see how the introduction of a persuasive message or a commitment device may affect contributions to a public good.

Although a large literature on public good games experiments has demonstrated the effect of various type of incentives and has identified mechanisms that may enhance cooperation (see surveys by Ledyard, 1995 and Chaudhuri, 2011), few have looked at the effectiveness of simple persuasion or commitment devices. Though the economic reflection has been recently enriched of some contributions in social psychology that help developing less expensive and more effective strategies to change behavior. A prominent framework to explain and predict behaviors is provided by the *Theory of Planned Behavior*. It has been demonstrated to be efficient in the analysis of behavioral changes in a large variety of domains such as the medical, environmental and fiscal ones (see for instance Steinmetz et al., 2016 for a meta analysis). The *Theory of Planned Behavior* points the fact that the behavior is often a direct outcome of intention which in turn is related to the subject's attitude toward the behavior. This attitude being affected by social interaction through subjective norms (Ajzen, 1991). If these motivational variables support the same decision they both fuel intention in the same way. Attitudes and subjective norms determine intentions, that in turn explains behavior, if perceived behavioral control is not negatively activated. In more details the attitude is a "relatively enduring predisposition to respond favorably or unfavorably" toward something (Simons, 1976). Subjective norms rest on beliefs about the normative expectation of what is important or appropriate for others in terms of behavior.

Previous research has long linked the various elements that go from attitudes to behavior and has highlighted the complex entanglement of individual, environmental and social characteristics on the decision and as the consequence the final behavior. This means that in order to modify behavior, we may think that we must act on intentions (through actions targeted at attitudes or on

the environment or its perception, or on many of these elements at the same time) and the behaviors that are consistent with these attitudes will naturally be put in place.

While most prevention campaigns are based on this process, it must be noted that in some cases, there is a discrepancy between the opinions expressed and the observed behaviors. For example, almost everyone is for recycling waste or the use of public transport but not everyone is finally doing it. The issue is then how to change peoples' attitude to get these people to behave in the same way. In social psychology, three groups of theories attempt to answer this question: the models of persuasion (Simons, 1976; Bromberg and Trognon, 2006; Girandola, 2003), the theory of commitment (Kiesler, 1971) and the theory of the binding communication (Joule et al., 2007b) that represents a conceptual bridge between persuasion and commitment.

Persuasion theories aim at generating a change of attitude so that the latter allows a change of behavior. Since attitude refers to the idea that the individual would be predisposed to give assessments on the social and economic world and that doing so would behave in the direction of its assessment, persuasion would then involve information (and its channel of communication) that aims at changing attitudes (Rosenberg and Hovland, 1960; Zanna and Rempel, 1988). Thus persuasion involves a source (transmitting an information or communicating) and a target (receiver) and it plays on an intermediate dimension of behavioral intention (Armitage and Conner, 1999, 2001; Godin and Kok, 1996; Sheeran, 2002).<sup>1</sup>

However the link between attitudes and behaviors can be challenged by adding an intermediate dimension of behavioral intention (Ajzen, 1985). Since intentions are self-explanatory instructions that allow one to have particular behaviors, forming a behavioral intention is for the individual to think about what he or she will have to do and the efforts he or she will have to make in order to achieve a goal (Triandis, 1980; Ajzen, 1991). Several studies have shown that the supposed control of intentions on behavior may be much more limited than expected (see i.e. Randall and Wolff, 1994; Sheppard et al., 1988). Theories of commitment and then binding communication try to bridge this gap.

The theory of commitment applies in the context of the concept of "freely consented submission". The idea is to introduce a preparatory act that freezes the system of possible choices by focusing the individual on the behavior directly related to his or her decision. *It is not our attitudes or motivation that engage us, only the acts do.* The commitment can take various forms and be manipulated to increase its level. The important factors are the visibility or the importance of the act and the reasons for the act. It means that the acts of commitment can also vary from oral commitment procedures (as votes or

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<sup>1</sup>A recent paper by Dal Bo and Dal Bo (2015) has pointed that observing a message with a moral standard can result in a significant increase of contributions in a voluntary public good game. Particularly moral suasion appears to be effective through how it changes expectations and preferences.

public expression of an opinion) to stronger acts (like written declarations or signed declarations, with or without public visibility). It is the act and not the simple informative or communicative action that is at the origin of the behavioral changes.<sup>2</sup>

Finally binding communication corresponds to an articulation between persuasion and commitment (Joule, 2000; Joule et al., 2007a). It associates the realization of a consistent preparatory act with a subsequent persuasive message. Binding communication thus combines some elements of both previous theories but it adds visibility to commitment towards the others. This should facilitate the change of attitude and behavioral change in the direction of the desired results. In recent studies, communication has been shown to be strong in inducing right behaviors in several situations (Charness and Dufwenberg, 2006; Charness et al., 2013; Bhanot, 2017; Di Bartolomeo et al., 2017).

In all three cases, the question of the message used to provide information and to persuade is a challenging point. In the specific case of our study, it has some important consequences for implementation. Social dilemmas bring together situations where social interaction is central. Voluntary Contribution Games are of that kind where there is a conflict between private and public interest and public outcomes depends on individual decisions to contribute to the benefit of the group. In line with the literature on the Theory of Planned Behavior, besides personal inclination, social interaction will impact intentions and may decrease contributions if subjects believe the others contribute less or not at all. The reverse also holds. For such a reason our design should be based on information giving emphasis on social links of the group but in a very neutral way by stating what is good for the group. By doing so, we give room for manoeuvre to activate social norms to impact intentions. We can also, through commitment devices, activate personal norms with increasing levels of intensity.<sup>3</sup>

This questions the characteristics of the social norm and how it affects the individual behavior. Social norms, as defined by Elster (1989), are shared rules of conduct that are partly sustained by approval and disapproval. Nyborg et al.

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<sup>2</sup>Commitments strategies have been used in several fields such as education (Kiesler, 1971), public policies (Health with (Girandola, 2008), (Pechmann and Wang, 2010), pro-social effects and tax compliance (Torgler, 2004; Shimeless et al., 2017), public good contributions (Hergueux et al., 2016), truth-telling (Jacquemet et al., 2018), or pro-environmental policies (Girandola et al., 2010; Toledo, 2016). All studies support a greater effectiveness of the strong commitment on the weak commitment and also the superiority of non-problematic acts.

<sup>3</sup>Numerous academic studies demonstrate that social norms can impact a wide range of behaviors, including pro-environmental and pro-social behaviors such as: electricity savings, recycling and pollution efforts, charitable donations, dishonesty, consumption decisions of standard goods or services (food, exercise) or addictive products (drugs or alcohol). The interest for norm based policies comes from the expected dual and temporal impact researchers have underlined. On the one hand if norms can rapidly modify individual decisions they have short terms effects. On the other hand when they spread among the population, through social interactions and information one can expect a modification in social dynamics and a long term impact.

(2016) enlarge the description of channels through which norms acts stating that social information can affect individuals because people react to social disapproval. Also some people may take the behavior of others as an indication of what is most effective and others may expect reciprocity in exchange for their own conformity. Social norms effects on decision are a complex issue on a second dimension that deals with the implicit nature of norms and the design of message provided to inform about the norm in force.<sup>4</sup> This implicit dimension of norms creates an uncertainty of the result of social interactions (Muldoon et al., 2014). Furthermore the large set of implicit norms that may impact ones behavior and choices can be separated in two categories, namely descriptive norms and injunctive norms (Cialdini et al., 1990). Descriptive norms refer to what most people do. Injunctive norms describe what most people approve of doing with the additional possibility to distinguish personal injunctive norms (what one approves of doing, personally) from social injunctive norms (what one believes others approve of doing), respectively.

In this paper, we report on a series of experiments using injunctive norms to encompass part of the continuum existing from the persuasive theory to that of commitment and binding communication. The guideline being the increase in the number of procedures involved: information; information and commitment by action (either low written declaration or high signing a document) and a last strategy adding potential visibility and binding communication. Following the results of the above mentioned literature we have built a 5 treatments design with: (0) a baseline treatment made of a Voluntary Contribution Mechanism (*Baseline* hereafter); (1) an information treatment where information is displayed to subject on the benefits of contributing to the collective fund (*Information*) before participating to the VCM; (2) a low commitment treatment where subjects are asked to declare their personal opinion on the benefits of contributing before doing so (*Declaration*); (3) a high commitment treatment as subjects are asked to sign the information displayed on the benefits of contributing before doing so (*Commitment*); (4) a promise treatment where they commit to contribute and send back signed papers to the experimenter before doing so (*Promise*). The goal is to compare persuasion techniques to three commitment strategies defined by an increasingly committing act and potential visibility. The paper has also a wide scope since it deals with the wide topic of cooperation and supports that the aforementioned psychological theories could provide to achieve the desired act at minimal cost and in a decentralized manner.

Our results are twofold. First we find that all four procedures increase significantly the level of contributions. Surprisingly, the most effective devices are *Information* and *Promise*. Second we show that in the four treatment conditions, the decay of contributions across periods is reduced in comparison with the *Baseline*. This is especially true for the two committed mechanisms:

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<sup>4</sup>Young (2015) describes them as "the unwritten codes and informal understandings that define what we expect of others and what others expect of us".

*Commitment and Promise.*

The following of the paper is organized as follows. Section 2 describes in all details our experimental design. Section 3 presents our main results. Section 4 concludes.

## 2 Experimental Design

The experiment consists of a repeated Voluntary Contribution Mechanism (VCM) played by fixed groups of four subjects for 30 periods. All sessions were conducted at the University of Strasbourg and in total, 200 subjects participated to ten sessions (two for each treatment condition). The subjects were recruited from a list of experimental subjects maintained at the Experimental Economics Laboratory of Strasbourg using the ORSEE software (Greiner, 2015). The experiment was computerized. Upon arrival, each subject was assigned a computer randomly. The instructions were read aloud by the experimenter and before starting, a comprehension questionnaire was administered to check that the rules were well understood. All questions were answered in private. Once the 30 periods were completed, the screens displayed the total cumulative gains for the experiment and the subjects answered a post-experimental questionnaire. At the end of the session, subjects were paid their earnings in a separate room and in private. There was a conversion rate of 30 tokens to €1. Average earnings were €24.9 (standard deviation = 4.4).

As exposed above, there are five different treatment conditions: *Baseline*, *Information*, *Declaration*, *Commitment* and *Promise*. In all treatments, subjects played the same VCM. At the beginning of each period, each subject receives an endowment of 20 tokens and has to decide simultaneously and without the possibility of communicating how many tokens they want to keep for themselves and how many tokens they want to allocate to a group account. Each token contributed to the group account yields a payoff of 0.4 tokens to each of the four members of the group. Therefore the earnings of individual  $i$  who contributes  $c_i$  to the group account in a period are given by:

$$\pi_i = 20 - c_i + 0.4 \sum_{k=1}^4 c_k$$

The *Baseline* treatment replicates this standard repeated VCM for 30 periods. In the four other treatments, we implemented four different information and commitment rules. Although providing different kind of incentives, these four treatments were implemented in a very similar way<sup>5</sup>.

In the *Information* treatment, before the repeated VCM starts, the subjects were provided information on an individual sheet of paper that explicitly stands that "at each period, contributing to the group project increases welfare

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<sup>5</sup>Detailed instructions and the specific procedures for each treatment are presented in the appendix.

of every group member.” Then after the participants played 30 periods of the VCM as in the *Baseline*. This constitutes the simplest definition of persuasion. Subjects receive information on what is good to do for the group.

In the *Declaration* treatment, every subject was asked to make a simple statement. Practically they received a sheet of paper on which they had to make a choice before getting back the sheet to the experimenter. The choice was: ”At each period, I consider that contribution to the group project is important in order to increase the welfare of every group member: yes/no”. This declaration was gathered by the experimenter and was not known of the other participants. In this treatment a low commitment strategy is then applied with a simple expression of an opinion.

In the *Commitment* treatment, the process was similar to that of the information treatment except that the subjects had to formally sign a statement wherein they commit (or not) to contribute to the group project. The statement was ”At each period, I commit to contribute to the group project in order to increase welfare of every group member: yes/no + signature”. As for the declaration, the commitment was gathered by the experimenter and was not known of the other participants. Here the commitment is strong and require a signature which has been found to be rather effective.

Finally, in the *Promise* treatment, the procedure is the same as for the commitment except that the commitment is transmitted to each member of the group but only to the members of your group. This information remains anonymous and the members of your group cannot identify whom is making the promise to contribute. They know however how many members of the group have promised to contribute. In this last treatment, visibility of the commitment act is introduced.

Our experimental design allows us to see how we can modify behavior by acting on attitudes, on intentions, on the environment and its perception. The design roughly follows the path of psychological theories ranging from theories of persuasion to those of commitment and then committing communication. They are elaborated successively to see if we observe an increase of efficiency throughout the process. Let us remind that the literature demonstrates, in most cases, a superior effectiveness of committing communication on commitment alone and on persuasion.

### 3 Results

We present the results in two-steps. First we present contribution at the group level, this to account for interdependence of outcomes for members of a given group. In a second step we present the individual choices of contributing to the public good to identify the effects of the treatments on free-riding behavior and full contribution.

### 3.1 Group contributions

Table 1 presents the average contributions by group in each treatment with the standard deviation. The lowest average contribution is observed in the *Baseline*. Table 1 also shows that on average the highest contribution is observed in the *Information* treatment. The second highest level is observed in the *Promise* treatment. Surprisingly the lowest level of contributions is observed in the *Commitment* treatment.

Results from Mann-Whitney rank-sum tests of the difference between two given treatments are reported in Table 2. In all statistical tests, the unit of observation is the group. On average, contributions are significantly different between every couples of treatment<sup>6</sup>. These results confirm the effectiveness of simple commitment rules in improving cooperation in social dilemma situations as already pointed in the literature (Burger, 1999; Ellingsen and Johannesson, 2004; Charness and Dufwenberg, 2006; Dal Bo and Dal Bo, 2015; Hergueux et al., 2016).

***Result 1: All treatments increase significantly the level of contributions. The highest level is observed in Information and Promise followed by Declaration and Commitment***

Table 1: Average group contribution by treatment

|             | Obs. | Mean | Sdt. Dev. |
|-------------|------|------|-----------|
| Baseline    | 300  | 20.6 | 16.6      |
| Information | 300  | 42.3 | 22.3      |
| Declaration | 300  | 35.7 | 23.3      |
| Commitment  | 300  | 30.6 | 20.1      |
| Promise     | 300  | 40.0 | 19.3      |

Figure 1 illustrates the mean contribution by period in each of the five treatments. The pattern of contribution in the *Baseline* is consistent with that observed in previous studies (see Ledyard, 1995 and Chaudhuri, 2011). Contributions start from about 50% of the endowment and then continuously decrease until period 30. In the *Declaration*, *Information* and *Promise* treatments, the contributions are much higher in the initial period than in the *Baseline*. Surprisingly, it is not the case of contributions in the *Commitment* treatment. However, in the *Commitment* treatment, the contributions are well above the *Baseline* in the rest of the periods and do not display similar decay.

The differences between treatments are confirmed by regressions results in Table 3. The first column present Tobit estimation of the group contribution explained by the treatment and the periods<sup>7</sup>. The reference is the *Baseline*

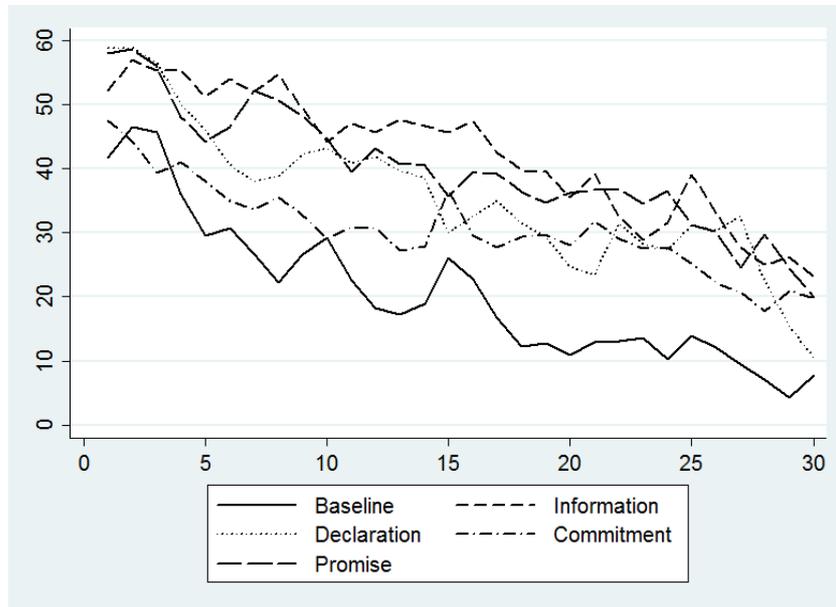
<sup>6</sup>We also performed tests of different distribution using Epps-Singleton Two-Sample Empirical Characteristic Function test and obtain significant differences between treatments.

<sup>7</sup>Similar results are obtained when using OLS regressions instead

Table 2: MannWhitney Rank Sum Tests of Differences in Contribution Levels between Treatments

|             | Information                 | Declaration                 | Commitment                  | Promise                     |
|-------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| Baseline    | $z = -23.304$<br>$p < 0.01$ | $z = -16.028$<br>$p < 0.01$ | $z = -12.284$<br>$p < 0.01$ | $z = -23.013$<br>$p < 0.01$ |
| Information |                             | $z = 7.001$<br>$p < 0.01$   | $z = 12.871$<br>$p < 0.01$  | $z = 2.238$<br>$p = 0.0252$ |
| Declaration |                             |                             | $z = 5.187$<br>$p < 0.01$   | $z = -5.259$<br>$p < 0.01$  |
| Commitment  |                             |                             |                             | $z = -11.522$<br>$p < 0.01$ |

Figure 1: Average group contributions overs periods



treatment. The results confirm the strong effect of three of our four incentivized treatments on the group contribution. *Information* has the strongest effect, followed by *Promise* and *Declaration*. Along time we observe a decline in the level of contribution. In the second column, we introduce interaction effects between treatment variables and time. As noticed above, one observe an initial higher level of contribution in the treatment conditions (except for *Commitment*) than in the *Baseline* but it is hard to observe a different decreasing pattern than in the *Baseline* (except for *Commitment*). The results show that in the initial period, the difference of contribution between the *Baseline* and the four treatment conditions are significant, although marginally for *Commitment*. The decay of contributions is lower than in the *Baseline* in the *Commitment* treatment and the *Promise* treatment.

Table 3: Determinants of group contributions - Random-effects Tobit models

|                    | (1)                  | (2)                  |
|--------------------|----------------------|----------------------|
| Information        | 24.187***<br>(7.163) | 22.270***<br>(7.233) |
| Declaration        | 16.803**<br>(7.162)  | 15.816**<br>(7.231)  |
| Commitment         | 11.221<br>(7.162)    | 2.179<br>(7.230)     |
| Promise            | 20.706***<br>(7.162) | 16.459**<br>(7.230)  |
| Period             | -1.106***<br>(0.017) | -1.326***<br>(0.039) |
| Period*Information |                      | 0.133**<br>(0.054)   |
| Period*Declaration |                      | 0.072<br>(0.054)     |
| Period*Commitment  |                      | 0.592***<br>(0.054)  |
| Period*Promise     |                      | 0.282***<br>(0.054)  |
| Constant           | 36.345***<br>(5.071) | 39.644***<br>(5.113) |
| $N$                | 6000                 | 6000                 |

Notes: Random-effects panel estimations. Standard errors in parentheses

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

***Result 2: In all treatments, the contributions are well above the Baseline in almost all periods. But the decay is only reduced in the Commitment and Promise treatments.***

### 3.2 Individual contributions

We now turn to individual contributions in order to explain the differences between treatments. The higher effectiveness of our four conditions can be explained by how these type of incentives lead to reduce the free-riding.

Figure 2 presents the distribution of individual level of contributions across periods by treatment. In the *Baseline*, we observe 40% of zero contributions in total. This figure is much reduced in the four treatment conditions where the percentage fall to 16% in *Information*, 28% in *Declaration*, 20% in *Commitment* and 10% in *Promise*. These proportions are significantly lower than in the *Baseline* at 5% level (Two-sample sample test of proportions, see Table 4). On the other hand, it is also very interesting to note that the proportion

of full-contributors is also significantly increased in all treatment conditions compared to the *Baseline* treatment. Here again, the proportion of full contributors is significantly different than in the Baseline in every treatments (Two-sample sample test of proportions, see Table 5). Among these treatments, the highest increase of full-contributors is observed in *Information* and the lowest level of free-riding is observed in *Promise*. These results confirm previous finding by Hergueux et al. (2016) that show that the effect of an oath of honesty in increasing average contributions and more particularly high level contributions. However, contrary to their results, our treatments reduce the level of zero contributions<sup>8</sup>.

**Result 3: The four treatment conditions reduce the level of free-riding and increase the full-contribution.**

Figure 2: Distribution of individual contributions

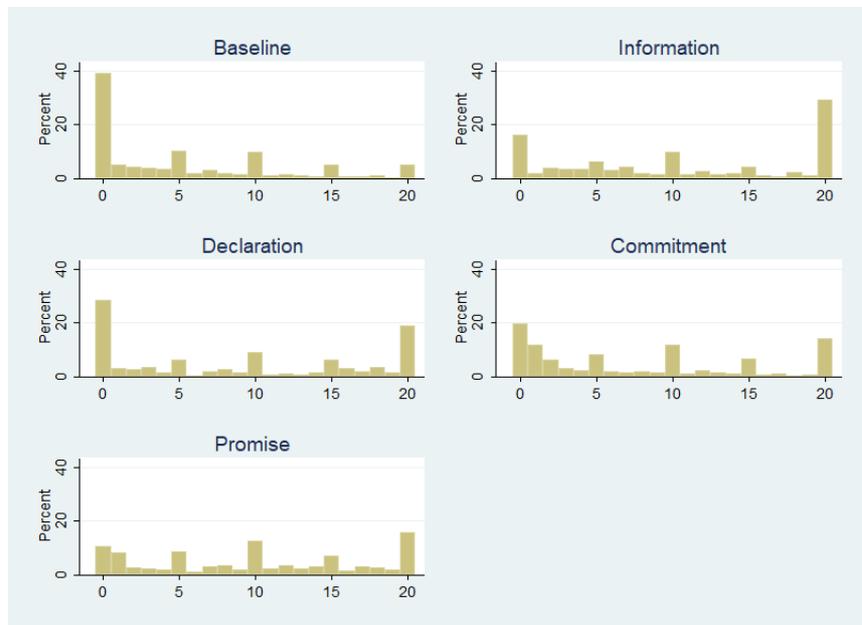


Table 6 present Tobit estimations of the determinants of individual contributions<sup>9</sup>. The specification includes control for age, gender and if the subject is a student in economics or management. In addition to treatment variables, we also introduce a period variable as well as the contribution in the preceding period. The reference is the *Baseline* treatment. The results confirm the strong effect of our four treatments on the individual contribution. *Information* has

<sup>8</sup>Our design goes one step further in explicitly indicating what is the social optimum in the public good game.

<sup>9</sup>We present results using a panel random-effect approach. However all the results are robust to the use of other specifications such as OLS, group clustered and individual clustered standard errors.

Table 4: Two-sample sample test of proportions of zero contributions between Treatments

|             | Information               | Declaration               | Commitment                  | Promise                   |
|-------------|---------------------------|---------------------------|-----------------------------|---------------------------|
| Baseline    | $z = 12.46$<br>$p < 0.01$ | $z = 5.57$<br>$p < 0.01$  | $z = 10.30$<br>$p < 0.01$   | $z = 16.12$<br>$p < 0.01$ |
| Information |                           | $z = -7.07$<br>$p < 0.01$ | $z = -2.28$<br>$p = 0.0225$ | $z = 4.07$<br>$p < 0.01$  |
| Declaration |                           |                           | $z = 4.82$<br>$p < 0.01$    | $z = 10.94$<br>$p < 0.01$ |
| Commitment  |                           |                           |                             | $z = 6.31$<br>$p < 0.01$  |

Table 5: Two-sample sample test of proportions of full contributions between Treatments

|             | Information                | Declaration                | Commitment                | Promise                     |
|-------------|----------------------------|----------------------------|---------------------------|-----------------------------|
| Baseline    | $z = -15.66$<br>$p < 0.01$ | $z = -10.52$<br>$p < 0.01$ | $z = -7.60$<br>$p < 0.01$ | $z = -8.50$<br>$p < 0.01$   |
| Information |                            | $z = 5.77$<br>$p < 0.01$   | $z = 8.86$<br>$p < 0.01$  | $z = 7.93$<br>$p < 0.01$    |
| Declaration |                            |                            | $z = 3.18$<br>$p < 0.01$  | $z = 2.21$<br>$p = 0.0272$  |
| Commitment  |                            |                            |                           | $z = -0.97$<br>$p = 0.3306$ |

the strongest effect, followed by *Promise*. *Declaration* and *Commitment* have a smaller but significant effect on contributions. Those who contributed a lot in the past contribute more in the current period. Along time we observe a decline in the level of contribution. As for the group contributions, we consider how our treatments affect contributions along time. In the second column of results, we introduce interactions between the treatment dummy variables and the period. We find that participants in the *Information*, *Declaration* and *Promise* treatments initially contribute more. There is no initial difference in contribution between *Commitment* and the *Baseline* but we observe that in *Commitment* and in *Promise*, the participants decrease less their contributions when compared to subjects in the *Baseline*. These results are consistent with the possibility that our simple commitment process (both in *Commitment* and *Promise* treatments) can actually ensure long-lasting effects and some permanence in the level of cooperation.

In the last two columns, we estimate a random-effect Logit model to explain the decision to contribute zero tokens or to contribute the total amount of the endowment. As observed previously, the four treatment conditions decrease the free-riding and increase the full-contribution. This data presents strong evidence that all four processes increase contributions by restraining the free-

Table 6: Determinants of individual contributions - Random-effects models

|                    | Tobit                |                      | Logit                |                      |
|--------------------|----------------------|----------------------|----------------------|----------------------|
|                    | Contribution         | Contribution         | Zero contr.          | Full contr.          |
| Information        | 9.323***<br>(1.797)  | 9.492***<br>(1.903)  | -1.994***<br>(0.562) | 2.658***<br>(0.715)  |
| Declaration        | 5.438***<br>(1.756)  | 5.211***<br>(1.857)  | -0.904*<br>(0.541)   | 1.557**<br>(0.701)   |
| Commitment         | 4.274***<br>(1.772)  | 0.769<br>(1.869)     | -2.345***<br>(0.572) | 1.186*<br>(0.713)    |
| Promise            | 7.909***<br>(1.773)  | 6.549***<br>(1.871)  | -2.951***<br>(0.574) | 1.513**<br>(0.713)   |
| Relative contr.    | 3.791***<br>(0.578)  | 3.783***<br>(0.575)  | 0.089<br>(0.201)     | 1.398***<br>(0.291)  |
| Period             | -0.386***<br>(0.013) | -0.459***<br>(0.029) | 0.101***<br>(0.006)  | -0.120***<br>(0.007) |
| Age                | -0.004<br>(0.234)    | -0.004<br>(0.234)    | 0.023<br>(0.074)     | 0.089<br>(0.091)     |
| Female             | -1.437<br>(1.118)    | -1.464<br>(1.120)    | -0.395<br>(0.357)    | -1.313***<br>(0.438) |
| Period*Information |                      | -0.001<br>(0.040)    |                      |                      |
| Period*Declaration |                      | 0.021<br>(0.040)     |                      |                      |
| Period*Commitment  |                      | 0.231***<br>(0.039)  |                      |                      |
| Period*Promise     |                      | 0.093**<br>(0.039)   |                      |                      |
| Constant           | 8.521<br>(5.523)     | 9.559<br>(5.544)     | -2.603<br>(1.749)    | -4.745**<br>(2.152)  |
| <i>N</i>           | 5800                 | 5800                 | 5800                 | 5800                 |

Notes: Random-effects panel estimations. Standard errors in parentheses.

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

riding behavior and by encouraging virtuous contributions.

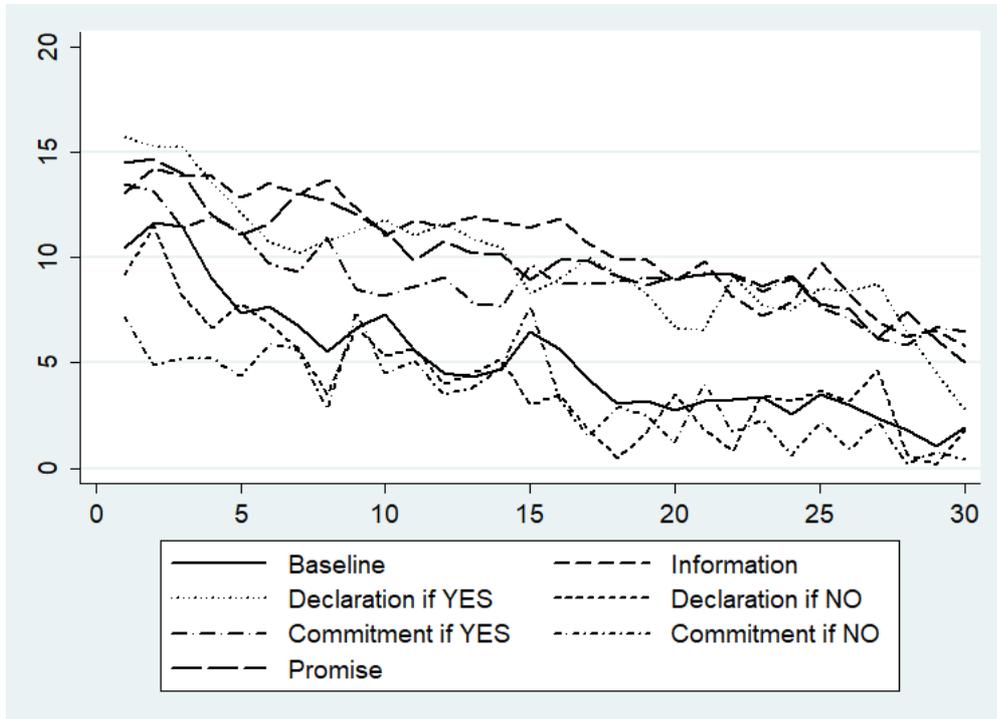
Finally, a last interesting results concern the decision to answer “Yes” or “No” to the question to contribute or not in the three decision treatments. Table 7 presents average individual contribution by treatment and by answer “Yes” or “No”. We observe that 85%, 75% and 100% of participants answered “Yes” to the question in the Declaration, Commitment and Promise treatments respectively. Interestingly, there is a particularly high willingness to declare forthcoming contributions when this information is directly transmitted to the other members of the group. More interestingly, we observe that among those who declared forthcoming contributions, they contribute on average zero

tokens in about 24% of the decisions but this rate falls to 7% and 10% in the *Commitment* and *Promise* treatments. Figure 3 shows that for those who did not declare they will contribute, there is no differences with the *Baseline*. This tends also to confirm the strength of the two engaging treatments compared to the others. For those who engaged, they comply.

Table 7: Average individual contribution by treatment and by decision to answer YES or NO

|             | Commit | Obs. | Mean  | Sdt. Dev. |
|-------------|--------|------|-------|-----------|
| Baseline    | -      | 1200 | 5.15  | 6.04      |
| Information | -      | 1200 | 10.58 | 7.66      |
| Declaration | All    | 1200 | 8.93  | 7.88      |
|             | Yes    | 1020 | 9.75  | 7.88      |
|             | No     | 180  | 4.27  | 6.05      |
| Commitment  | All    | 1200 | 7.64  | 7.11      |
|             | Yes    | 900  | 9.03  | 7.00      |
|             | No     | 300  | 3.49  | 5.72      |
| Promise     | All    | 1200 | 9.99  | 6.88      |
|             | Yes    | 1200 | 9.99  | 6.88      |
|             | No     | -    | -     | -         |

Figure 3: Average individual contributions overs periods



## 4 Conclusion

An important question in economics is how to promote contribution in social dilemma situations. This question becomes even central when we look both at cost-effectiveness of public program and sustainability of the funding institutions. There are rooms for finding less costly and easy implementable mechanisms that foster cooperation and contribution for the public sake.

In this paper, we examine the impact of persuasive and commitment devices on contributions to a public good. We find that commitments and promises made by subjects to others increase significantly the level of contributions. We also find that they have long-lasting effects, that is they reduce the importance of the decay usually observed along time in public good contributions. These results mainly come from the reduction of the number of zero contributors as well as the increase of full contributors.

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## A Appendix

### A.1 Instructions

Thank you for participating in this experiment on decision making. In this experiment, your earnings depend on both your decisions and the other participants’ ones. We ask you to read these instructions carefully; they should allow you to understand the experience. All your decisions are anonymous. You will never enter your name on the computer. You indicate your choice on the computer to which you are sitting.

From now we ask you not to talk. If you have a question please raise your hand and an experimenter will meet you in private. It is forbidden to communicate with another participant during the experiment. If you violate this rule you will be disqualified from this experience and of any potential payment.

The 20 participants in the experiment are divided into groups of 4. So you are in a group with three other participants. You cannot know the identity of other members of your group. As no member can know your identity. You do not know the constitution of other groups. Your group will remain the same throughout the experiment. Your earnings will depend on your decisions and the decisions of other members of your group.

This experience includes 30 successive periods. In each period, you will earn gains calculated in tokens. At the end of the experience your total earnings

in tokens accumulated over the 30 periods will be translated at the following rate: 30 tokens = 1 euro. Gains in euro you have made will then be paid in cash.

At the beginning of each period you get 20 tokens. These 20 tokens constitute your initial endowment for this period. You must decide how to use this endowment. More precisely, you must decide how many tokens you want to invest in a common project to the group to which you belong and how many tokens you want to keep for you.

Specifically, at the beginning of each period you decide the number of tokens between 0 and 20 you want to invest in the common project. Choosing your investment in the project automatically determines the number of tokens you keep for yourself (20 minus your investment fees). *For example, if you decide to invest 15 tokens in the project, you keep 5 tokens for you.*

After each member of your group has made its investment choices, you are informed of the total amount invested in the project (that is to say your contribution and the others' ones). You are also informed of your earnings for that period.

Your earnings for this period are the sum of two amounts:

1. The number of tokens you have not invested in the joint project and you have kept for you.
2. The income obtained through your investment in the joint project.

The investment in the joint project entitles you to an income. The income of the joint project is 40% of total contributions to the project of the 4 members of the group (including your contribution).

Your gain for the period =  $(20 - \text{your invested amount}) + 0.4 * (\text{the total of the invested amounts})$

The income from the project is calculated in the same way for all members of your group, each group member thus receives the same project income.

- *For example, if the total amount invested by the four members of the group is 60 tokens, each group member receives an income of  $0.4 * 60 = 24$  tokens. If the total investment is 9 tokens, each group member receives an income of  $0.4 * 3.6 = 9$  tokens from the project.*

All the tokens that you do not invest in the joint project are for you. On the other hands, each token you spend for the joint project increases the total contribution of 1 token and therefore increases your income from the proposed  $0.4 * 1 = 0.4$  token. The income of other group members is also increased by 0.4 token in this case. Your investment in the joint project thus increases the income of other group members. Similarly, any investment in the joint project by another member of the group increases your own income and that of other group members.

- *For example, if all group members keep their initial endowment of 20 tokens and do not contribute to the joint project, each group member receives 20 tokens he or she kept and receives nothing from the project. The total gain for each member is 20 tokens.*
- *If all group members invest their entire initial allocation of 20 tokens in the project, the sum of contributions is 80 tokens. Each group member will therefore receive an income of 32 tokens of the project and kept 0 token. The total gain for each member is 32 tokens.*

## A.2 Experimental treatments

There is one Baseline in which subjects play the repeated VCM explained in the instructions and four additional treatments. In each of these four treatments, we introduce different rules just before the subjects start the VCM. Here are the detailed procedures for each one:

- Information treatment
  - After reading the instructions, the experimenter says aloud: " We would like you to read carefully the following information (sheets of paper are distributed). When all the participants will have read this information, we shall get back the sheets".
  - On the sheet, the subject can read: "At each period, contributing to the group project increases welfare of every group member".
  - Once the papers collected, subjects start the VCM for 30 periods.
- Declaration treatment
  - After reading the instructions, the experimenter says aloud: "We would like you to answer the following question (sheets of paper are distributed). On this sheet we ask you to make a choice. When all the participants will have answer this question, we shall get back sheets. This information will remain anonymous".
  - On the sheet, the subject can read: "At each period, I consider that contribution to the group project in order to increases welfare of every group member: yes/no".
  - Subjects make their decision, the papers are collected and the VCM starts for 30 periods.
- Commitment treatment
  - After reading the instructions, the experimenter says aloud: "We would like you to answer the following question (sheets of paper are distributed) On this sheet we ask you to make a choice. When all the participants will have answer this question and sign the

document, we shall get back sheets. This information will remain anonymous”.

- On the sheet, the subject can read: ”At each period, I commit to contribute to the group project in order to increases welfare of every group member: yes/no + signature”.
- Subjects make their decision, the papers are collected and the VCM starts for 30 periods.

- Promise treatment

- After reading the instructions, the experimenter says aloud: ”We would like you to answer the following question (sheets of paper are distributed). We are going to distribute you three sheets of answers, 3 small white envelopes and a big brown envelope. We ask you to make a choice and to indicate it identically on the 3 sheets of answers. Once this choice was made, please sign at the bottom of the 3 sheets. Then please put every sheet answer in a white envelope and seal without writing anything above. Put then the 3 white envelopes in the big brown envelope and seal. Then indicate your number of post on and only on the big brown envelope. When all the participants will have made their choice, we shall get back sheets and shall transmit them to the members of your group and only to the members of your group. This information remains anonymous and the members of your group cannot identify you”.
- On the sheets, the subject can read ”At each period, I commit to contribute to the group project in order to increases welfare of every group member: yes/no +signature”.
- Subjects make their decision, the papers are collected and send to the members of the group. Then the VCM starts for 30 periods.