A Hybrid Public Good Experiment Eliciting Multi-Dimensional Choice Data

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Abstract

Similar to Fischbacher and Gächter (2010) we try to understand and explain the motivation of participants when contributing to a public good. In the Hybrid Public Good experiment each of two interacting contributors chooses an independent contribution level and three adjusted contribution levels when (s)he, as the only adjusting player, learns that the other's independent contribution is smaller, equal or larger than the own one. We systematically vary the probability that one player can adjust, based on such qualitative information, but maintain that no adaptation at all and adaptation by only one occurs with positive probability. Adaptation is framed in two ways, once by additively changing the own independent contribution and once by stating new contribution levels. Surprisingly, there is a strong framing effect which increases with experience. Reacting to coinciding independent contributions implies impressive conformity in contributing. Reacting to higher, respectively lower independent contributions implies average upward, and, more strongly, downward adaptation.

Keywords: Public goods, experiments, voluntary contribution mechanism.
JEL: C91, C72, H41

1. Introduction

Inspired by Revealed Preference theory (Samuelson 1938, Varian 2006), the Revealed Motive approach of experimental economics tries to infer motives like preference relations, aspiration levels, inclinations towards risk and ambiguity, other-regarding concerns etc. purely from experimental choice data. In this paper, we do not discuss nor question this approach but

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demonstrate how it can be made more informative by eliciting multi-dimensional rather than one-dimensional choice data in a public good experiment.[1]

Recently, other scholars have attempted a similar goal. Fischbacher and Gächter (2010), for example, study experimentally a normal form version of a sequential public good game with one randomly determined first mover and three followers. All four participants are asked to choose an independent contribution and, as followers, for a response strategy specifying their reaction to the leader's choice. Here, the strategic uncertainty of each follower, who does not know the other followers' response strategies, renders the interpretation of response behavior ambiguous. To avoid this problem, we consider a two-player game ruling out strategic uncertainty when "following".

In our design, each participant chooses an independent contribution as well as adjusted contributions depending on how the other's independent contribution compares with the own one. Furthermore, unlike Fischbacher and Gächter (2010), response behavior is based on qualitative information: adjustment conditions only on whether the other's independent contribution is higher than, lower than, or equal to the own one. Finally, either none or only one contributor can adapt the independent contribution according to a commonly known probability p, which is the unique "within subject" treatment variable.

We consider three different probability levels: low ($p = 2.5\%$), middle ($p = 33\%$), and high ($p = 49\%$). When the probability p of adjustment is low, it is very unlikely that either contributor can adjust, hence the situation is close to a standard public good game with free riding being dominant. As p increases, the nature of the game changes[2]: while the same prediction for optimal choices follows from once repeated elimination of dominant strategies[3], it becomes more likely that one will be able to adapt: hence the game gets closer to a trust game. Indeed, suppose that the probability of adjustment is $p = 49\%$: since the probability

[1]See Di Cagno et al. (2015) for a more fundamental discussion of the (dis-)advantages of the Revealed Motive approach in experimental research.

[2]Another interpretation of the nature of our game refers to the leadership in voluntary contribution games, see e.g. Croson et al. (2005) and Levati et al. (2007).

[3]Fischbacher and Gächter (2010) rely on this stronger rationality postulate and thus somewhat weaken the dilemma aspect of their experimental game.

that none can adapt is only 2%, contributors essentially face a symmetric trust game with both players assuming the trustor and the trustee role with 49% probability each. In this case, the independent contribution can be interpreted as a trustor investing in trustworthiness, while the adapted contributions reveal trustworthiness of a trustee. Similarly to Berg et al. (1995),[4] trustor and trustee can choose among different contribution levels. However, trustees can condition their choice only on qualitative information.[5]

Our two between subjects treatments differ in the way how contributions are adjusted. In the Pure Adjustment (thereafter PA) treatment, subjects state an independent contribution and then are asked what to add to or subtract from the independent contribution in order to determine the final contribution. To maintain the independent contribution, the adjustment can be set equal to zero.

This way of asking for adjustment of (independent) contributions may trigger quite different reactions such as:

- opposition/inertia/resistance to change ("I want to maintain my independent contribution!");
- an obligation to change when new information is provided;
- a desire for flexibility allowing for both, positive and negative adjustments.

To control for this (demand) effect, we consider the Contribution Choice (thereafter CC) treatment: contributors choose an independent contribution and then the contributions by which they react to qualitative information.

Rather than running our hybrid public game (HPG hereafter) just once, we wanted to explore how experience affects play without endangering the one-off character of the game. We thus let participants play recursively but with new randomly selected partners.

Given our experimental design, we are able to test how contributions react to the different frames and probabilities of adjustment across rounds of playing the HPG. To anticipate our

[4]The experiment by Fischbacher and Gächter (2010) allows also for many different choice levels but features more than one trustee.

[5]In this sense our setup resembles sequential Prisoners' Dilemma (PD) experiments with binary choice sets.

findings: average independent and adapted contributions are generally higher in treatment CC and increasing with the probability of adaptation. The greater probability of adjustment sustains more voluntary cooperation across plays of HGP with this effect being stronger in treatment CC. The finding is surprising since we expect experience to render participants more immune to framing. In our view it is striking how participants react to the changing nature of the game due to different probabilities of adaptation.

Concerning whether and how contributions are adapted we can state the following: coinciding independent contributions are mostly maintained and one reacts to a higher independent contribution by the other, on average, by an increase but to a lower one by a quite stronger decrease. The first result confirms earlier findings, e.g. Croson et al. (2005) report that participants like to match the contributions of others which could be due to conformity seeking, e.g. as claimed by Carpenter (2004). However, Carpenter refers to conformity seeking as "copying the most relevant behavior in a population". In our set up with limited feedback information on others' behavior, conformity seeking can be interpreted in two ways: either as coincidence of independent contributions so that no adjustment establishes conformity or as tendencies to adjust in the direction of the other's independent contribution. In our context, as well as for Fischbacher and Gächter (2010), such conformity seeking could also be implied by let-down aversion or conditional cooperation.[6]

Our findings also suggest that conditional cooperation is affected by the salience of conditioning. In particular, higher probability of adaptation implies higher and more persistent cooperation, whereas for low probability of adaptation the dynamics of contributions are consistent with those of standard public good experiments, even with those using random strangers matching (see e.g. Fehr and Gächter, 2000). Similar to Fischbacher et al. (2001), we also consider different types of contributors, namely *conditional cooperators* and *exploiters*, or free-riders.[7] A conditional cooperator increases (decreases) her independent contribution if the other's independent contribution is larger (smaller) and does not adapt if it is equal to the

[6] This might explain why Carpenter (2004) wants to define conformity seeking more distinctively.

[7] Even though we use the same, natural, terminology for types, there are differences rendering our findings not directly comparable to those of Fischbacher et al. (2001).

own one. An exploiter, or free-rider, never contributes, either independently or when adjusting. Quite naturally, we expect a monotonic reaction to p and more free-riding behavior for small p due to the weaker trust game character.

The paper is organized as follows: Section 2 describes the experimental protocol. The descriptive and statistical data analysis is presented in section 3. We analyze the independent contributions and adjustments both from a static point of view across conditions as well as dynamically. Section 4 concludes.

2. Experimental protocol

In each experimental session, participants choose their contributions for 45 successive rounds, grouped in three phases of 15 rounds. Phases differ in the probability p of adjustment, which is either low ($p = 2.5\%$), middle ($p = 33.3\%$), or high ($p = 49\%$). Since each participant can adjust with probability p, the probability that none of them will adjust is equal to $1 - 2p$. The probability level in each phase is commonly known and occurs in increasing or decreasing sequences for a given session i.e. the increasing, respectively decreasing probability sequence is implemented "between subjects". In all rounds of a given phase, subjects are randomly matched with a different anonymous partner. Participant were informed about this random rematching to weaken repeated game effects.

In each round, participants are endowed with 9 tokens (1 token = 0.5€) and state their independent contribution. Without knowing the other's independent contribution, participants then adjust their independent contribution conditional on whether the other's independent contribution is lower than, equal to, or greater than the own one. After the independent and the adjustment (for the three cases) choices, the computer − according to p − randomly selects whether one and, if so, which participant can adjust her independent contribution.

The payoffs are computed at the end of each round according to the standard public good linear payoff function:[8]

$$\pi_i = 9 - c_i + 0.8(c_i + c_j) \tag{1}$$

Here c_i (c_j) is the actual contribution of subject i (j), which is equal to the independent (adjusted) contribution if subject i does not (does) adapt. In the experiment all choices are restricted to integers.

2.1. Treatments

The experiment distinguishes two framing treatments, differing in the way how contributions are adjusted:

- in the Pure Adjustment treatment (TR PA), each subject chooses her independent contribution c_i^0 – with $0 \leqslant c_i^0 \leqslant 9$ – and subsequently states the amount $\Delta_i^?$ – with $? \in \{=, +, -\}$ and $-c_i^0 \leqslant \Delta_i^? \leqslant 9 - c_i^0$ – to be added to (if positive) or subtracted from (if negative) the independent contribution in case the other's independent contribution is higher than (+), lower than (−) or equal to (=) her own one.

- in the Contribution Choice treatment (TR CC), each subject chooses her independent contribution c_i^0 – with $0 \leqslant c_i^0 \leqslant 9$ – and subsequently states the adjusted contributions $c_i^?$, with $? \in \{+, -, =\}$ and $0 \leqslant c_i^? \leqslant 9$ in case the other's independent contribution is higher than (+), lower than (−) or equal to (=) her own one.

In TR PA the actual contribution of subject i is $c_i^0 + \Delta_i^?$ if she is randomly selected to adjust, and c_i^0 otherwise. Similarly, in TR CC the actual contribution of subject i is $c_i^?$ if she is randomly selected to adjust, and c_i^0 otherwise.

Observe that in both "between subjects" treatments the same final contributions are available since in TR PA any $c_i^?$ with $0 \leqslant c_i^? \leqslant 9$ can be realized via appropriate adaptations $\Delta_i^?$ with $-c_i^0 \leqslant \Delta_i^? \leqslant 9 - c_i^0$.

[8] We use the term "project" in the experiment. This type of payoff function has been disseminated by Marvell and Ames (1979, 1980, 1981).

2.2. Sequences

As "within subjects treatments" the probability levels could differ across phases in the following way:

- in sequence A probability levels are increasing, hence $p = 2.5\%$ in phase 1, $p = 33.3\%$ in phase 2, and $p = 49\%$ in phase 3;
- in sequence B probability levels are decreasing, hence $p = 49\%$ in phase 1, $p = 33.3\%$ in phase 2, and $p = 2.5\%$ in phase 3.

The structure of the experiment is summarized in Table 1.

2.3. Feed-back information and payment

At the end of each round, participants are reminded of

- their independent contribution;
- their potential adaptations (either $\Delta_i^?$ in TR PA or $c_i^?$ in TR CC);
- the probability p of adapting in the current phase.

Moreover, they are informed about

- the random event (based on probability p) allowing possible adjustment of at most one independent contribution;
- their own payoff in the current round computed according to (1).

When one of the paired participants can adjust the independent contribution, the one who could adapt is told only whether the other's contribution was greater than, lower than or equal to the own one, while the other is only told that the partner could adapt. In addition, the own final payoff is communicated to either participant. When participants could not adapt, they are told that no adaptation has occurred and their own final payoff.

Table 1: The experimental protocol

Treatments	Pure Adjustment (PA): Adjustment via $\Delta_i^?$		Conditional Contribution (CC): Adjustment via $c_i^?$	
	Sequence A	Sequence B	Sequence A	Sequence B
Sessions	2	2	2	2
Phase 1	2.5%	49%	2.5%	49%
Phase 2	33.3%	33.3%	33.3%	33.3%
Phase 3	49%	2.5%	49%	2.5%
Rounds per phase	15	15	15	15
Subjects per session	32	32	32	32
Subjects	60(†)	64	64	64
Average earning (€)	20	20.19	20.36	20.31
Min. earning (€)	16.5	16.5	14.5	14.5
Max. earning (€)	23.5	26.5	24.5	25.5

† In one session of Treatment PA, sequence A: 28 subjects instead 32.
Participation fee: €2.5.

At the end of the session the computer randomly selects one round of each phase for payment. Each individual earns the sum of payoffs, corresponding to these (three) selected rounds. In addition, each participant received a show-up fee of €2.50. Subjects were paid in cash privately at the end of each session.

We ran 8 sessions at the laboratory of the Max Planck Institute in Jena. A total of 252 students (7 sessions of 32 participants plus 1 session of 28) were recruited among the undergraduate population of Jena University using Orsee (Greiner, 2004).

Subjects were provided with a hard copy of the instructions, which were read aloud by the experimental proctor (for an English translation of the instructions see Appendix). The experiment was fully computerized using z-Tree (Fischbacher, 2007).

Overall, subjects spent about 90 minutes in the laboratory, and earned on average €20.50, with slightly higher average payment in treatment CC, both sequences. Minimum earnings are higher in treatment PA, while maximum payments are higher in sequence B, in both treatments.

3. Hypotheses

We test several hypotheses concerning framing, sequence of probabilities, dynamics of contributing, and types of contributors.

- for *framing*, we test whether contributions differ due to the mode of adaptation. Although treatment PA and CC feature the same choice sets, we predict a stronger persistence of independent contributions when these are Δ-adapted as in treatment PA than when they are c-adapted as in treatment CC;

- for *sequence of probabilities*, we expect no persistent sequence effects but strong monotonic reactions of contributions to p with more free riding for smaller p due to the weaker trust game character;

- regarding *the contribution dynamics*, framing effects should disappear with experience and final contributions decrease across the 15 rounds within phases;

- for *types of contributors*, we expect, consistently with previous findings, more conditional contributors than freeriders.

3.1. Treatment and probability effects

Our first result confirms a significant framing effect: the way in which subjects state their adapted contributions (either via Δ-adaptation or via c-adaptation) affects the level of independent and adjusted contributions, even though choice sets are the same in both treatments.

Results 1: *Average independent contributions are significantly higher in treatment CC than in treatment PA. Average adapted contributions are generally higher in treatment CC than in treatment PA (see Table 2).*

Average independent contributions are significantly higher in treatment CC than in treatment PA when pooling the data of sequence A and sequence B as well as when considering them separately (see Table 2, column 1). The latter reveals that the order of probabilities (increasing vs. decreasing) does not affect average independent contributions.

Regarding adjusted contributions, the pattern is similar: in treatment CC average $c_i^=$ and c_i^- are significantly higher than in treatment PA, while c_i^+ is not statistically different across

Table 2: Contributions by sequences and treatments[†]

	c_i^0	Δ_i^+	$\Delta_i^=$	Δ_i^-	c_i^+	$c_i^=$	c_i^-	c_i
	Sequence A and Sequence B							
CC	**4.268**	**0.270**	-0.230	-1.594	4.537	**4.038**	**2.674**	**4.020**
PA	**4.035**	**0.502**	-0.205	-1.518	4.537	**3.830**	**2.517**	**3.762**
	0.00	0.00	0.35	0.09	0.99	0.00	0.00	0.00
	Sequence A							
	c_i^0	Δ_i^+	$\Delta_i^=$	Δ_i^-	c_i^+	$c_i^=$	c_i^-	c_i
CC	**4.277**	**0.275**	-0.173	-1.753	4.552	**4.104**	2.524	**3.997**
PA	**4.049**	**0.547**	-0.129	-1.626	4.596	**3.920**	2.423	**3.761**
	0.01	0.00	0.21	0.06	0.62	0.03	0.16	0.00
	Sequence B							
	c_i^0	Δ_i^+	$\Delta_i^=$	Δ_i^-	c_i^+	$c_i^=$	c_i^-	c_i
CC	**4.258**	**0.264**	-0.287	-1.435	4.522	**3.971**	**2.823**	**4.044**
PA	**4.022**	**0.459**	-0.276	-1.417	4.481	**3.746**	**2.605**	**3.763**
	0.00	0.00	0.79	0.76	0.64	0.01	0.00	0.00

[†]Mean values and P-values for frame effect
TR CC is based on 2880 observations and TR PA counts 2770 observations.

treatments (see Table 2, columns 5-7). This latter result is due to the fact that Δ_i^+ is significantly higher in treatment PA than in treatment CC and therefore offsets the lower level of the independent contribution observed in treatment PA.

Similarly to the independent contributions, the pattern of the adjusted contributions is independent of the sequence of probabilities. Evidently, anticipating whether and how one revises triggers more independent and final voluntary cooperation in treatment CC than in treatment PA. This, of course, questions all purely outcome-based social preferences and suggest that the mode of adaptation triggers partly specific reasons when and how to adapt, for example, inertia or resistance to change or an obligation to react to new information which could inspire c_i^0-choices allowing for flexibility in adaptation, e.g. via $c_i^0 = 4$ or 5.

According to the last column of Table 2 the actual final contribution is on average greater in treatment CC irrespective of sequence, a result consistent with those for independent and adjusted contributions.

Table 3 focuses on probability effects and confirms a significant and monotonic probability effect.

Table 3: Contributions by treatments and probabilities†

	Treatment PA and CC							
	c_i^0	Δ_i^+	$\Delta_i^=$	Δ_i^-	c_i^+	$c_i^=$	c_i^-	c_i
$p = 2.5\%$	**3.723**	**0.517**	**-0.051**	**-1.178**	**4.240**	**3.672**	2.545	**3.702**
	0.00	0.00	0.00	0.00	0.00	0.00	0.43	0.00
$p = 33.3\%$	**4.248**	**0.394**	**-0.268**	**-1.652**	**4.642**	**3.980**	2.596	**3.702**
	0.00	0.00	0.06	0.00	0.25	0.02	0.41	0.77
$p = 49\%$	**4.489**	**0.241**	-0.335	**-1.840**	4.730	**4.154**	2.649	3.979
	Treatment PA							
	c_i^0	Δ_i^+	$\Delta_i^=$	Δ_i^-	c_i^+	$c_i^=$	c_i^-	c_i
$p = 2.5\%$	**3.549**	0.590	**-0.056**	**-1.103**	**4.139**	**3.492**	2.446	**3.524**
	0.00	0.61	0.00	0.00	0.00	0.00	0.73	0.00
$p = 33.3\%$	**4.092**	**0.560**	**-0.287**	**-1.615**	**4.652**	**3.805**	2.477	**3.831**
	0.00	0.00	0.77	0.00	0.11	0.00	0.08	0.28
$p = 49\%$	**4.465**	**0.355**	-0.272	**-1.837**	4.820	**4.192**	2.627	3.932
	Treatment CC							
	c_i^0	Δ_i^+	$\Delta_i^=$	Δ_i^-	c_i^+	$c_i^=$	c_i^-	c_i
$p = 2.5\%$	**3.891**	**0.446**	**-0.046**	**-1.251**	**4.338**	**3.845**	2.640	**3.875**
	0.00	0.00	0.00	0.00	0.01	0.00	0.46	0.01
$p = 33.3\%$	**4.399**	**0.233**	**-0.249**	**-1.688**	**4.632**	**4.150**	2.711	**4.162**
	0.28	0.15	0.00	0.07	0.93	0.76	0.66	0.18
$p = 49\%$	4.513	0.130	**-0.395**	-1.843	4.642	4.117	2.669	4.023

†Mean values and below P-values for probability effects (between $p = 2.5\%$ vs. 33.3% and $p = 33.3\%$ vs. 49%).

Results 2: *Average independent and adapted contributions are generally increasing with the probability of adjustment (see Table 3)*

When considering both (between subjects) treatments together, we find that independent as well as adapted contributions c_i^+ and $c_i^=$ are higher in phases with higher probability. In case of c_i^- the value remains constant across probabilities regardless of the frame, i.e. mode of adaptation. When considering each treatment separately, independent and adjusted contributions steadily increase from low to high probability (see Table 3, column 1 and columns 5-7). Moreover for $\Delta-$adjustments, Table 3 confirms that average Δ_i^+ is decreasing, while average $\Delta_i^=$ and Δ_i^- are increasing in absolute value with probability p (see Table 3, columns 2-4).

These results justify our arguments, put forward in the introduction: when the adjustment probability p is low the game perceived as a usual public good game while, when p is high, it is seen as a trust game. Subjects seem to realize this and modify their contributions accordingly. In particular, for $p = 49\%$, independent contributions are higher since as trustor one likes to invest more in trustworthiness. However, since for $p = 49\%$ average Δ_i^+ is lowest, using the jargon of trust games, we can say that rewarding such trusting is rather limited. Furthermore, since Δ_i^- is highest in absolute value, there is a strong negative reaction when the other's investment in trust is lower than the own one which suggests self-serving concerns: one reacts less strongly when adjustment is costly than when it is favorable.

To further investigate limited rewarding of trust and self-serving concerns, we introduce a measure of expected $\Delta-$adjustments of independent contribution which is defined as follows:[9]

$$d_i^j(c_j^0) = p\Delta_i^?(c_j^0) \;\; \text{where } \Delta_i^?(c_0^j) = \begin{cases} \Delta_i^- & \text{if } c_i^0 > c_j^0 \\ \Delta_i^= & \text{if } c_i^0 = c_j^0 \\ \Delta_i^+ & \text{if } c_i^0 < c_j^0 \end{cases} \tag{2}$$

We consider the value of d_i^j using actual data and data from simulated pairs of subjects, obtained by pairing each subject with every other subject in the same round of the same sequence in a given treatment.[10,11]

Note that simulated data differ from actual ones since they neglect individual feedback effects stemming from the information received by subjects e.g. about their current payoff after each round. Therefore, this simulation provides a robustness check of our sample results.

Tables 4 and 5 report average actual and simulated d_i^j and additionally average values of final, i.e. after adjustment, total contribution both for actual and simulated data. Table 4 relates expected adjustments and public good provision to frame: actual expected adjustments do not vary across treatments, hence they are not related to frame, while the opposite is true for final public good provision, which is significantly affected by frame and significantly higher in treatment CC. Simulated expected adjustment is larger (in absolute value) in treatment CC, irrespective of sequences, and the same holds for public good provision.[12]

[9] Observe that $d_i^j(c_j^0)$ can be equivalently expressed as $c_i^0 - [(1-p)c_i^0 + p(c_i^?(c_j^0))]$, that is as the difference between the independent contribution and the expected adjusted contributions.

[10] For example, each individual in, say, the third round of phase 3 in the session with increasing probability under treatment PA is matched with every other subject in the third round of phase 3 in the session with increasing probability under treatment PA.

[11] We were able to implement this procedure thanks to the strategy (vector) method adopted in the experiment; it results in 703,620 observations regarding independent contributions and adapted contributions.

[12] We do not report simulated data on independent contributions and adjustments: their averages are the same as those in Tables 2 and 3. Since the same observations are used repeatedly, standard errors decrease

Table 4: d_i^j and public good provision (PGP) by sequences and treatments[†]

	Sequence A and Sequence B			
Data	Actual	Simulated	Actual	Simulated
	d_i^j		PGP*	
CC	-0.269	**-0.270**	**8.040**	**8.010**
PA	-0.256	**-0.250**	**7.525**	**7.561**
	0.48	0.00	0.00	0.00

	Sequence A			
Data	Actual	Simulated	Actual	Simulated
	d_i^j		PGP*	
CC	-0.315	**-0.312**	**7.993**	**7.940**
PA	-0.294	**-0.287**	**7.523**	**7.507**
	0.47	0.00	0.00	0.00

	Sequence B			
Data	Actual	Simulated	Actual	Simulated
	d_i^j		PGP*	
CC	-0.223	**-0.228**	**8.088**	**8.080**
PA	-0.220	**-0.217**	**7.526**	**7.609**
	0.91	0.00	0.00	0.00

[†] Mean values. P-values for frame effect.
* Public good provision is final contribution to public good: PGP= $c_i + c_j$

Table 5 relates expected adjustments and public good provision to probability level p. Irrespective of treatment, average d_i^j from actual data is negative and, in absolute value, increasing more than proportionally with adjustment probability. These results confirm our intuition that, when the game is closer to a trust game, rewarding trust is, on average, more dominated by self-serving concerns, whence the negative expected adjustment.

In the larger set of simulated data we find a similar pattern for d_i^j which, however, seems more pronounced in the CC treatment. This suggests that the trust game interpretation may be more salient for treatment CC featuring less rewarding of trust and more pronounced self-serving concerns.

Finally, public good provision has a similar pattern in simulated and actual data: it increases with probability p in treatment PA, while it decreases between $p = 33.3\%$ and $p = 49\%$ for treatment CC. As probability p increases, the independent contribution becomes larger whereas the magnitude of the adjustments Δ decreases. The final contributions reflect this double effect.

drastically and the frame and probability effects appear as highly significant.

Table 5: d_i^j and total public good provision (PGP) by treatments and probabilities†

	Treatment PA and CC			
Data	Actual	Simulated	Actual	Simulated
	d_i^j		PGP*	
$p = 2.5\%$	**-0.014**	**-0.013**	7.405	**7.406**
	0.00	0.00	0.00	0.00
$p = 33.3\%$	**-0.272**	**-0.270**	**7.998**	**7.994**
	0.00	0.00	0.70	0.26
$p = 49\%$	**-0.501**	**-0.497**	7.957	7.978
	Treatment PA			
Data	Actual	Simulated	Actual	Simulated
	d_i^j		PGP*	
$p = 2.5\%$	**-0.012**	**-0.011**	**7.048**	**7.044**
	0.00	0.00	0.00	0.00
$p = 33.3\%$	**-0.263**	**-0.249**	**7.661**	**7.704**
	0.00	0.00	0.16	0.00
$p = 49\%$	**-0.494**	**-0.489**	7.865	**7.936**
	Treatment CC			
Data	Actual	Simulated	Actual	Simulated
	d_i^j		PGP*	
$p = 2.5\%$	**-0.017**	**-0.016**	**7.750**	**7.746**
	0.00	0.00	0.00	0.00
$p = 33.3\%$	**-0.281**	**-0.290**	**8.324**	**8.266**
	0.00	0.00	0.08	0.00
$p = 49\%$	**-0.509**	**-0.505**	8.047	**8.019**

† Mean values. P-values for probability effects (2.5% vs. 33.3%; 33.3% vs. 49%).
* Total public good provision: PGP= $c_i + c_j$

3.2. Dynamics of contributions

In this section we analyze the trend of independent and adapted contributions over the 15 rounds of each phase. Recall that, due to the random stranger matching protocol, there are no reputation nor reciprocity effects across rounds. Therefore, the evolution of choices reveals mainly how individual intrinsic motivation to cooperate is affected by past play.

Figure 1 reports the dynamics of independent and adjusted contributions for each probability level without distinguishing between treatment PA and CC (as we do in Figure 2). The dynamics of contributions react significantly to the probability of adaptation since, when p is low, subjects tend to behave less cooperatively across rounds. With the help of Table 6 (columns 1-3), we can confirm that for $p = 2.5\%$ and $p = 33.3\%$ independent contributions c_i^0 steadily decline across rounds, while they remain constant when $p = 49\%$. The first finding is consistent with standard results on public good games, also − however weaker − for "random strangers", while the second is consistent with experimental findings on repeated trust game.[13] Conditional contributions(see Figure 1) for $p = 2.5\%$ and $p = 33.3\%$ steadily decline across rounds irrespective of the qualitative information regarding the other's contribution. When $p = 49\%$, the adapted contributions c_i^+ are essentially constant, while the contributions $c_i^=$ and c_i^- are slightly declining. These results are confirmed by Table 6 and are summarized in the following

Result 3: *Greater probability p sustains more voluntary cooperation, independently of the qualitative information regarding other's independent contribution.*

Figure 2 shows that the decline in independent contributions is more pronounced in treatment PA than in treatment CC when $p = 2.5\%$, while the dynamics of independent contributions are similar for the two treatments when $p = 33.3\%$. When $p = 49\%$, independent contributions slightly decline in treatment PA, while they remain essentially constant in treatment CC. Adapted contributions follows a similar trend: the decline, when significant, is more pronounced in treatment PA than in treatment CC, with the exception of c_i^-. This latter feature confirms the observation, put forward in the analysis of the expected adjustment, that treatment CC reinforces the trust game nature of high adaptation probability, while treatment PA reinforces the public good game nature of low adaptation probability. These results are confirmed by the data in Table 6 (columns 4-6 and columns 7-9) and summarized in the following

Result 4: *When the probability of adaptation is low, the decline in voluntary cooperation is more pronounced in treatment PA; when the probability of adaptation is high, the persistence of voluntary cooperation is higher in treatment CC.*

Figure 1 also reveals that adaptations Δ_i^+ are (positive and) higher when $p = 2.5\%$ than when $p = 49\%$, and higher in treatment PA than in treatment CC. Furthermore, adaptations Δ_i^- are (negative and) higher in absolute value when $p = 49\%$ than when $p = 2.5\%$. Overall,

[13] See Ledyard (1995) for a survey on public good games. On trust games, see Berg et al. (1995) and Glaeser et al. (2000).

Table 6: Contributions and adjusted contributions through rounds[†]

Treatment	PA and CC			PA			CC		
Probability	2.5%	33.3%	49%	2.5%	33.3%	49%	2.5%	33.3%	49%
	c_i^0								
	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)
Round	-0.05***	-0.04***	-0.00	-0.08***	-0.04***	-0.01	-0.03*	-0.04***	0.01
	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)
Constant	4.15***	4.57***	4.51***	4.18***	4.43***	4.55***	4.11***	4.71***	4.47***
	(0.11)	(0.10)	(0.10)	(0.25)	(0.24)	(0.22)	(0.27)	(0.28)	(0.26)
Observations	3780	3780	3780	1860	1860	1860	1920	1920	1920
R^2	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
F	20.28	12.82	0.07	27.47	9.97	0.55	3.25	11.97	0.29
	c_i^+								
	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)
Round	-0.05***	-0.02*	-0.01	-0.06***	-0.02	-0.02	-0.03*	-0.02	0.01
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Constant	4.62***	4.83***	4.78***	4.66***	4.83***	5.00***	4.59***	4.82***	4.58***
	(0.11)	(0.11)	(0.11)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)
Observations	3780	3780	3780	1860	1860	1860	1920	1920	1920
R^2	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
F	14.87	3.44	0.30	14.19	1.69	1.58	3.13	1.75	0.19
	$c_i^=$								
	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)
Round	-0.05***	-0.05***	-0.02*	-0.07***	-0.06***	-0.03**	-0.03	-0.04**	-0.01
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Constant	4.08***	4.38***	4.32***	4.09***	4.28***	4.46***	4.07***	4.48***	4.17***
	(0.11)	(0.11)	(0.11)	(0.15)	(0.15)	(0.15)	(0.16)	(0.16)	(0.16)
Observations	3780	3780	3780	1860	1860	1860	1920	1920	1920
R^2	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00
F	18.03	17.75	2.81	20.81	13.41	3.97	2.61	5.64	0.18
	c_i^-								
	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)
Round	-0.03***	-0.02**	-0.02**	-0.05***	-0.01	-0.02	-0.01	-0.04**	-0.03**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
Constant	2.81***	2.78***	2.85***	2.88***	2.56***	2.78***	2.75***	2.99***	2.92***
	(0.10)	(0.10)	(0.10)	(0.13)	(0.13)	(0.13)	(0.14)	(0.14)	(0.14)
Observations	3780	3780	3780	1860	1860	1860	1920	1920	1920
R^2	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
F	9.64	4.65	5.53	13.69	0.51	1.72	0.71	4.97	3.90

[†]OLS regressions. Coefficients and standard errors (in parenthesis) are reported

$c_i^?$, where $? \in \{-, =, +\}$, is chosen directly in CC or via $c_i^? = c_i^0 + \Delta_i^?$ in PA.

these results suggest that, when $p = 49\%$, reward of trust remains limited across rounds and that self-serving concerns are persistent.

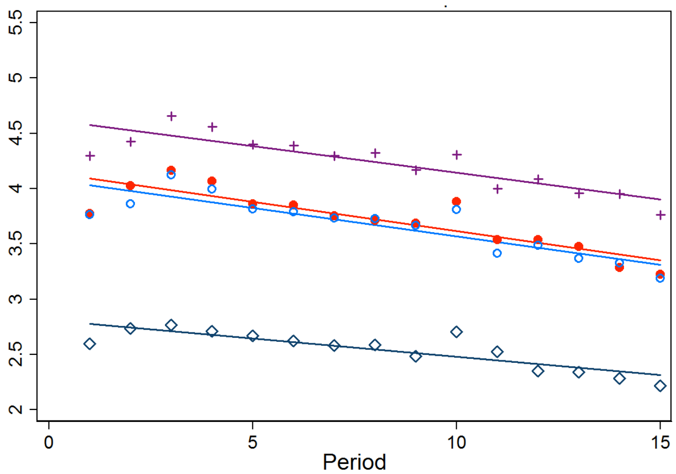
Table 7 analyzes the contribution dynamics as influenced by lagged contributions and lagged adjustments. The baseline specification is:

$$c_{it}^0 = \alpha Round_{it} + \beta_1 c_{it-1}^0 + \beta_2 (c_{it-1}^0)^2 + \beta_3 c_{-it-1}^0 + \gamma PO_{it-1} + \rho_1 \Delta_{i,t-1}^+ + \rho_2 \Delta_{i,t-1}^= + \rho_3 \Delta_{i,t-1}^- + \theta_i + v_{it}$$

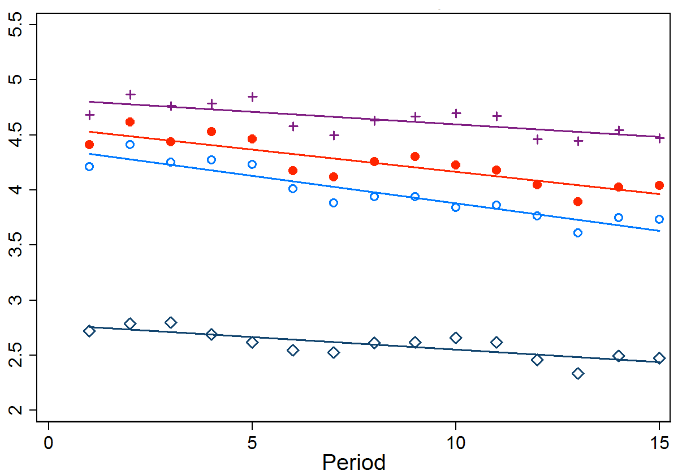
where the dependent variable is the independent contribution c_{it}^0. The explanatory variables are lagged contribution c_{it-1}^0, squared lagged contribution $(c_{it-1}^0)^2$ to control for possible non-linear correlations, lagged payoffs, and lagged adjustments $(\Delta_{i,t-1}^+, \Delta_{i,t-1}^=, \Delta_{i,t-1}^-)$. The estimation method is OLS with robust errors clustered on individuals.[14]

Results in Table 7 confirm that the lagged independent contribution has a significant posi-

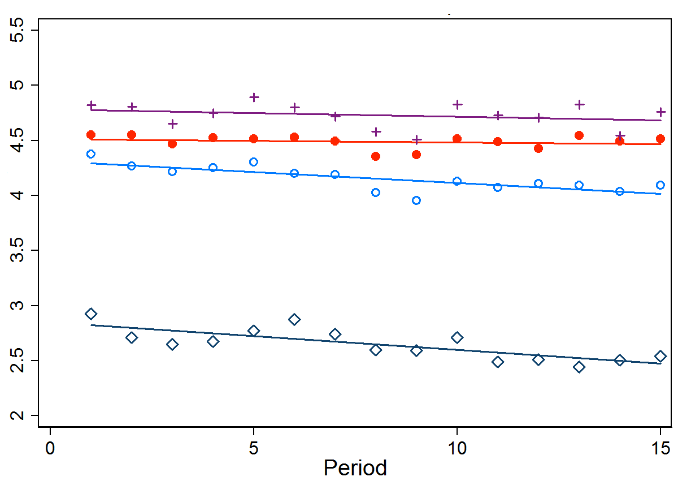
[14]Additionally, we estimated all specifications of Table 7 with random and fixed effects (the latter is preferred over random effects checking at the Hausman test), using Tobit with robust standard errors and finally the Arellano-Bond linear dynamic panel-data estimation method using Generalized Method of Moments (GMM) with robust standard errors. However, some specifications still have a significant second order correlation ($p(ar1) < 0.05$ and $p(ar2) < 0.05$), implying that their estimates are inconsistent. Generally all specifications are consistent with the results of this section.



(a) Adjustment Probability $p = 2.5\%$



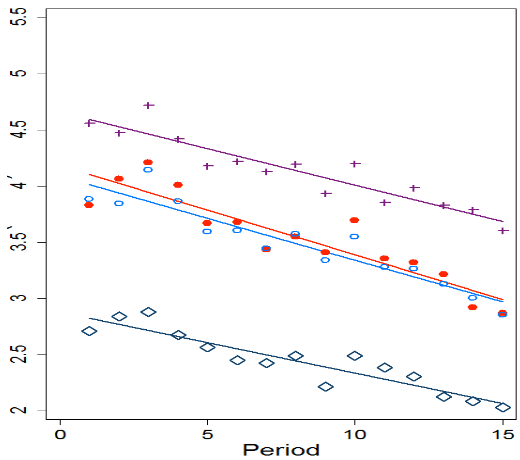
(b) Adjustment Probability $p = 33.3\%$



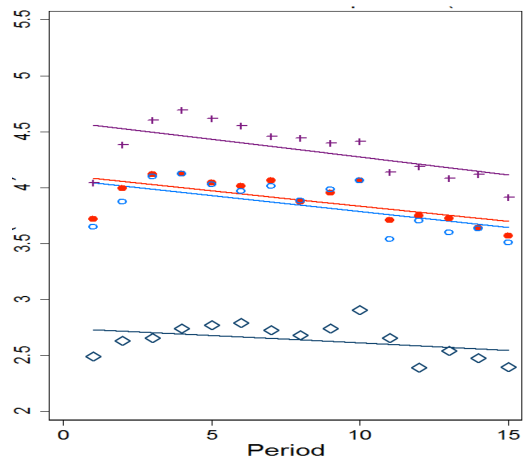
(c) Adjustment Probability $p = 49\%$

Notes: Average values in each round. $\bullet/c_i^0$ $\quad +/c_i^+$ $\quad \circ/c_i^=$ $\quad \diamond/c_i^-$

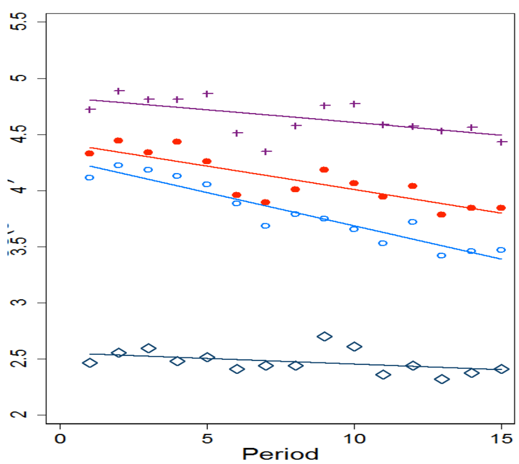
Figure 1: Independent and adjusted contributions



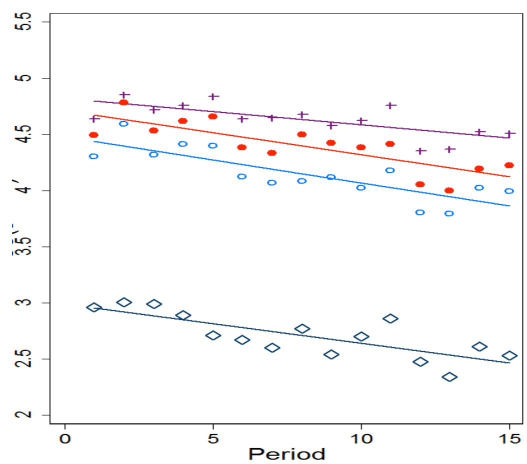
(a) Treatment PA, $p = 2.5\%$



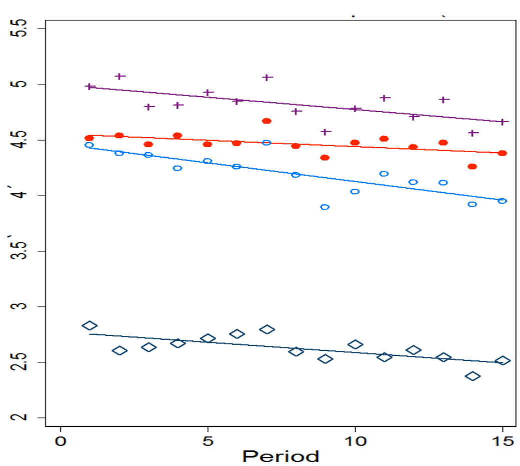
(b) Treatment CC, $p = 2.5\%$



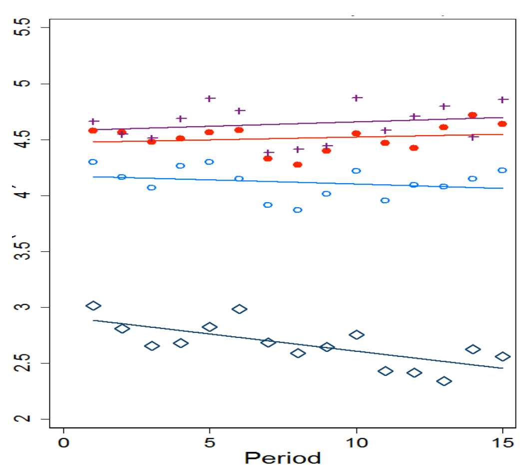
(c) Treatment PA, $p = 33.3\%$



(d) Treatment CC, $p = 33.3\%$



(e) Treatment PA, $p = 49\%$



(f) Treatment CC, $p = 49\%$

Notes: Average values in each round. $\bullet / c_i^0$ $\quad + / c_i^+$ $\quad \circ / c_i^=$ $\quad \diamond / c_i^-$

Figure 2: Independent and adjusted contributions by treatment

Table 7: Independent contributions depending on lagged contributions, and lagged adjustments

Treatment	PA+CC			PA			CC		
Probability	2.5%	33.3%	49%	2.5%	33.3%	49%	2.5%	33.3%	49%
	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)
$c^0_{i,t-1}$	0.95***	0.84***	0.82***	0.99***	0.77***	0.81***	0.89***	0.90***	0.81***
	(0.08)	(0.05)	(0.06)	(0.09)	(0.07)	(0.08)	(0.15)	(0.07)	(0.08)
$(c^0_{i,t-1})^2$	0.00	0.00	0.01	0.00	0.01	0.01	-0.00	-0.00	0.01
	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$c_{-i,t-1}$	-0.36	0.03	-0.06	-0.72***	-0.02	-0.15	0.12	0.03	0.01
	(0.29)	(0.08)	(0.07)	(0.22)	(0.11)	(0.12)	(0.58)	(0.12)	(0.08)
$\text{Payoff}_{i,t-1}$	0.53	-0.00	0.13	0.98***	0.07	0.25	-0.07	-0.02	0.04
	(0.36)	(0.11)	(0.09)	(0.28)	(0.15)	(0.16)	(0.72)	(0.15)	(0.10)
$\Delta^+_{i,t-1}$	0.12***	0.05**	0.11***	0.11**	0.10***	0.17***	0.13***	0.03	0.08**
	(0.03)	(0.02)	(0.03)	(0.05)	(0.03)	(0.03)	(0.05)	(0.03)	(0.03)
$\Delta^=_{i,t-1}$	-0.02	0.04	-0.07**	0.01	0.00	-0.12***	-0.06	0.07	-0.03
	(0.05)	(0.04)	(0.04)	(0.07)	(0.04)	(0.04)	(0.07)	(0.05)	(0.05)
$\Delta^-_{i,t-1}$	0.12***	0.04*	0.04*	0.11**	0.07**	0.06	0.14***	0.02	0.03
	(0.03)	(0.02)	(0.02)	(0.04)	(0.03)	(0.04)	(0.05)	(0.02)	(0.02)
Constant	-4.38	0.53	-0.61	-8.44***	-0.01	-1.58	0.94	0.62	0.18
	(3.27)	(0.96)	(0.85)	(2.51)	(1.34)	(1.42)	(6.49)	(1.39)	(0.97)
Observations	3656	3780	3652	1800	1860	1796	1856	1920	1856
R^2	0.66	0.74	0.71	0.63	0.70	0.69	0.69	0.77	0.73
F	333.87	494.14	505.92	135.05	253.96	246.15	273.03	264.30	298.70

OLS estimation. Robust standard errors in parenthesis clustered by individuals.

tive effect for any frame and any probability level, while the squared lagged contribution does not significantly affect the independent contribution. The effect of lagged adjustment is mostly significant for $\Delta^+_{i,t-1}$ and $\Delta^-_{i,t-1}$. This observation suggests inertia in stating independent contributions.

Result 5: *Independent contributions are positively and significantly affected by the previous contributions.*

In closing this section, let us consider the trust game character in the experimental setup of Fischbacher and Gächter (2010). Differently from our experiment, they exclude that independent contributions alone determine the final payoff what occurs in our setup with probability $1-2p$ varying from only 2% (when $p = 49\%$) to 95% (when $p = 2.5\%$). Therefore, the independent choices in their experiment cannot be interpreted as contributions without conditioning as in the usual public good game. Each independent contribution corresponds to the trustor's choice in one of four equally likely trust games (in normal form) where each trustor confronts the three other players as trustees.

If applied to our design with two players, the protocol of Fischbacher and Gächter (2010) would have implied a probability of adjustment $p = 50\%$, a borderline case due to $1 - 2p = 0\%$ which we approximated via $p = 49\%$. Hence, when comparing our findings with those of

Fischbacher and Gächter (2010), e.g. on the dynamics of voluntary cooperation for repeated play by random strangers, one should concentrate on $p = 49\%$. For this case, we observe a rather high and persistent level of cooperation which, in the setup of Fischbacher and Gächter (2010) might be endangered by free-riding attempts of the three trustees −a phenomenon which we excluded by selecting a two-player game. This, in turn, may trigger a decline of voluntary cooperation for large p due to the strategic uncertainty when "following" (Fischbacher and Gächter (2010) did not explore experience effects) .

3.3. On modes of behavior

We finally analyze modes of behavior, mainly two types of contributors: conditional cooperators and exploiters, or free-riders. With the help of our notation, we can define these two types of behavior as follows:

Conditional cooperation:

- for $c_i^0 = 0$: $\Delta_i^+ > 0, \Delta_i^= = 0$;
- for $0 < c_i^0 < e$: $\Delta_i^= = 0, \Delta_i^- < 0, \Delta_i^+ > 0$;
- for $c_i^0 = e$: $\Delta_i^= = 0, \Delta_i^- < 0$.

Exploitation (or Freeriding): $c_i^0 = 0$, all $\Delta_i^?$ minimal.

As confirmed by data in Table 8, the share of free-riding choices is lower than that of conditional cooperating choices. Furthermore, the share of free-riding choices is higher in treatment PA, possibly due to the stronger cognitive demand of this treatment,[15] and decreases with probability p for both frames.[16] On the other hand the frame is relevant only for $p = 2.5\%$.

[15] In treatment PA, subjects are forced to adjust their independent contribution in order to determine a given final contribution.

[16] The definition of the conditional cooperator does not exclude $c_i^0 = 0$ what, however, is rarely observed in our data. Indeed, conditional cooperators with $c_i^0 = 0$ account for less than 10% of the observations, with nearly half of these rare results (45%) concentrated on $p = 2.5\%$.

Result 6: *Conditional cooperation is significantly more frequent than freeriding in both treatments.*

Our findings are consistent with those obtained by Fischbacher et al. (2001), who classify subjects on the basis of "follower" contributions reacting to quantitative "leader" contributions. They categorize roughly a third (30%) of their subjects as free riders and roughly half (50%) as conditional cooperators. This experiment has been replicated, with some variations, at different locations, and the results are generally confirmed. [17] However, results from single locations in different (countries and) cultures are questionable since local differences may matter more than cultural ones.

Closer to our setting are the experiments by Fischbacher and Gächter (2010) and Fischbacher et al. (2012), who try to assess the effects of using the strategy (vector) method when eliciting cooperative preferences. With their methodology they classify roughly 55% of subjects as conditional cooperators and 23% as free riders. They also confirm, consistently with other repeatedly played public goods experiments, that contributions decline over time.

Table 9 replicates the dynamic analysis presented in Table 7 by adding as explanatory variables the two behavioral types. The independent contribution is – as expected – negatively correlated with free-riding behavior in the previous round while positively correlated with previous conditional cooperation.

Table 10 shows how the probability of being either type is affected by past choices and payoffs. Lagged independent contribution significantly affects only the probability of being free-rider. Lagged adjustments Δ_i^+ affect positively the probability of being conditionally co-

[17] Kocher et al. (2008) ran the experiment at single locations in the United States, Austria, and Japan (the original experiment by Fischbacher et al. (2001) was conducted in Switzerland) finding similar shares of types in Austria and Japan, but significantly different ones in the United States with a higher proportion of conditional cooperators (80.6%) and a lower one of free riders (8.3%). Herrmann and Thöni (2009) replicated the experiment at four locations in Russia: the distribution of types is very similar across locations. Moreover, while the proportion of conditional cooperators in this study is comparable to the one of Fischbacher et al. (2001), free riders account only for 6.3% of the total. Thöni et al. (2009) ran the experiment with a large pool of subjects in Denmark: a vast majority (70.2%) of subjects are conditional cooperators, while 13.9% are free riders. Martinsson et al. (2013) replicated the experiment in Vietnam and Colombia finding similar distributions of types except for the proportion of conditional cooperators (50% in Vietnam and 62.5% in Colombia). Moreover, when compared with the other studies, the proportion of free riders, 4.2%, is lower than in Switzerland, Austria, Denmark and Japan.

Table 8: Type of contributions by treatment and sequence

	Conditional Cooperator by sequences					
	Sequence A and B		Sequence A		Sequence B	
CC and PA	0.295		0.318		0.273	
CC	0.284		0.305		0.263	
PA	0.307		0.333		0.283	
T-test†	(***0.01***)		(***0.02***)		(0.09)	
	Conditional Cooperator by probabilities					
	$p = 2.5\%$	T-test (2.5% − 49%)	$p = 33.3\%$	T-test (2.5% − 33.3%)	$p = 49\%$	T-test (33.3% − 49%)
CC and PA	0.253	(***0.00***)	0.317	(***0.00***)	0.315	(0.84)
CC	0.235	(***0.00***)	0.009	(***0.00***)	0.306	(0.75)
PA	0.272	(***0.00***)	0.324	(***0.00***)	0.325	(0.97)
T-test†	(***0.01***)		(0.36)		(0.21)	
	Exploiter by sequences					
	Sequence A and B		Sequence A		Sequence B	
CC and PA	0.147		0.143		0.151	
CC	0.167		0.154		0.181	
PA	0.127		0.132		0.122	
T-test†	(***0.00***)		(***0.02***)		(***0.00***)	
	Exploiter by probabilities					
	$p = 2.5\%$	T-test (2.5% − 49%)	$p = 33.3\%$	T-test (2.5% − 33.3%)	$p = 49\%$	T-test (33.3% − 49%)
CC and PA	0.183	(***0.00***)	0.135	(***0.00***)	0.125	(0.18)
CC	0.195	(***0.00***)	0.157	(***0.00***)	0.149	(0.47)
PA	0.170	(***0.00***)	0.112	(***0.00***)	0.099	(0.22)
T-test†	(***0.04***)		(***0.00***)		(***0.00***)	

† P-values in brackets for T-test on frame effect.

operative, independently of the probability of adjustment, and negatively the probability of free-riding, in both cases with similar magnitude. Lagged adjustments Δ_i^- affect negatively both tendencies, with higher magnitude for conditionally cooperating than free-riding.

4. Conclusions

Evidence from public good experiments have shown that, in general, average contributions to the public good are higher than theoretically predicted.[18] To explain this finding, "warm glow" or altruistic preferences have frequently been invoked. As observed by Gächter (2007), such intrinsic motives leave one's behavior independent of others' contributions. However, individual choices often depend on how others behave; in particular, most people are conditionally cooperative: they mainly want to contribute if others do the same.[19]

We have contributed to the analysis of this behavior in public good games with a novel experimental design, eliciting multidimensional choice data based on qualitative information. In addition to multidimensional choices and use of the strategy vector method we have enlarged our data set by simulating pairs of subjects in order to asses the robustness of our findings.

[18]See e.g. Ledyard (1995).

[19]Several recent studies looked for a classification of social preferences according to such ideas, see Cooper and Kagel (2013) for a recent review.

Table 9: Independent contribution and lagged behavior

Treatment	PA+CC			PA			CC		
Probability	2.5%	33.3%	49%	2.5%	33.3%	49%	2.5%	33.3%	49%
	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)
$c^0_{i,t-1}$	0.86***	0.76***	0.71***	0.88***	0.64***	0.76***	0.82***	0.88***	0.67***
	(0.09)	(0.07)	(0.09)	(0.10)	(0.09)	(0.12)	(0.16)	(0.09)	(0.12)
$(c^0_{i,t-1})^2$	0.01	0.01*	0.02**	0.01	0.02***	0.01	0.00	-0.00	0.02*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$c_{-i,t-1}$	-0.37	0.01	-0.08	-0.74***	-0.04	-0.16	0.12	0.03	-0.02
	(0.29)	(0.08)	(0.07)	(0.22)	(0.11)	(0.12)	(0.57)	(0.12)	(0.08)
$\text{Payoff}_{i,t-1}$	0.54	0.02	0.16*	1.00***	0.11	0.26	-0.08	-0.02	0.08
	(0.36)	(0.10)	(0.09)	(0.28)	(0.15)	(0.16)	(0.72)	(0.15)	(0.11)
$\Delta^+_{i,t-1}$	0.09**	0.03	0.10***	0.10*	0.09**	0.17***	0.07	0.00	0.05
	(0.04)	(0.03)	(0.03)	(0.05)	(0.04)	(0.04)	(0.06)	(0.03)	(0.04)
$\Delta^=_{i,t-1}$	-0.01	0.04	-0.06*	0.02	0.00	-0.12***	-0.05	0.05	-0.02
	(0.05)	(0.04)	(0.03)	(0.07)	(0.04)	(0.04)	(0.07)	(0.05)	(0.05)
$\Delta^-_{i,t-1}$	0.13***	0.05**	0.05**	0.11**	0.07**	0.07	0.16***	0.04	0.04
	(0.04)	(0.02)	(0.02)	(0.05)	(0.03)	(0.04)	(0.05)	(0.02)	(0.03)
Freerider_{t-1}	-0.34*	-0.33*	-0.46**	-0.42*	-0.61**	-0.25	-0.28	-0.10	-0.61**
	(0.19)	(0.18)	(0.22)	(0.23)	(0.26)	(0.32)	(0.30)	(0.24)	(0.31)
Cond. Coop._{t-1}	0.09	0.10	0.05	-0.08	0.04	0.04	0.32**	0.19*	0.09
	(0.11)	(0.08)	(0.09)	(0.14)	(0.11)	(0.11)	(0.16)	(0.11)	(0.16)
Constant	-4.25	0.53	-0.56	-8.30***	0.01	-1.52	1.19	0.65	0.16
	(3.25)	(0.96)	(0.87)	(2.52)	(1.34)	(1.47)	(6.41)	(1.40)	(1.00)
Observations	3656	3780	3652	1800	1860	1796	1856	1920	1856
r2	0.66	0.74	0.71	0.63	0.71	0.69	0.69	0.77	0.73
F	268.96	402.04	408.39	114.13	211.65	194.53	226.52	217.76	269.99

OLS estimation. Robust standard errors in parenthesis clustered by individuals.

Table 10: Probit estimation for behavioral types†

	Conditional Cooperator			Freerider		
Probability	2.5%	33.3%	49%	2.5%	33.3%	49%
	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)	β/(se)
Round	-0.00	-0.00	-0.01*	0.01*	0.00	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$c^0_{i,t-1}$	-0.09	0.00	-0.01	-1.36***	-1.26***	-1.19***
	(0.09)	(0.08)	(0.07)	(0.18)	(0.12)	(0.10)
$(c^0_{i,t-1})^2$	0.02**	0.00	0.01	0.09***	0.11***	0.10***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$c_{-i,t-1}$	-0.12	0.03	0.09	0.82	-0.04	-0.03
	(0.25)	(0.10)	(0.07)	(0.59)	(0.15)	(0.12)
$\text{Payoff}_{i,t-1}$	0.16	-0.04	-0.11	-1.06	0.04	0.01
	(0.31)	(0.12)	(0.09)	(0.74)	(0.19)	(0.15)
$\Delta^+_{i,t-1}$	0.36***	0.27***	0.27***	-0.31***	-0.24***	-0.24***
	(0.05)	(0.05)	(0.04)	(0.05)	(0.05)	(0.04)
$\Delta^=_{i,t-1}$	-0.10	0.12**	0.07	0.18***	-0.01	0.16***
	(0.07)	(0.06)	(0.07)	(0.07)	(0.06)	(0.05)
$\Delta^-_{i,t-1}$	-0.23***	-0.27***	-0.22***	-0.11***	-0.02	-0.07**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.05)	(0.03)
Constant	-2.65	-0.94	-0.25	10.12	0.26	0.48
	(2.83)	(1.13)	(0.83)	(6.64)	(1.73)	(1.35)
Observations	3656	3780	3652	3656	3780	3652
Pseudo-R^2	0.22	0.23	0.23	0.49	0.56	0.54

† Probit estimation for conditional cooperative and freeriding choices.
Dependent variable: binary decision to behave as conditional cooperator (or freerider).
Robust standard errors clustered by individuals in parenthesis.

Our results reveal that conditional cooperation is affected by the salience of conditioning. In particular, higher probability of adaptation implies higher and more persistent cooperation, while the opposite holds for lower probability of adaptation. Moreover, reacting to coinciding independent contributions implies impressive conformity in contributing, whereas when reacting to higher (lower) independent contributions there are average upward and, more strongly, downwards effects in contributing. From the analysis of modes of behavior and their dynamics we can confirm that being a "conditional cooperator" versus "free-rider" does not appear to be an intrinsic characteristic, even though the proportions we find are consistent with those found in the literature: such attitudes respond to framing and own past choices: in spite of some inertia our data do not suggest persistent classification of subject types.

Our overall results (actual and simulated) could be used to suggest nudging via imposing the more welfare enhancing frame since choice sets for independent and final contributions are always the same. Such nudging would be in line with libertarian paternalism (Thaler and Sunstein, 2003). From an institutional point of view, one would suggest to design public good contribution schemes enhancing the role of trust (like our 49% setting). From a sequencing point of view, one might want to schedule high probability adaptation early, strengthening, respectively suggesting, the trust game character initially, similar to positioning healthy food products at the entrance of supermarkets.

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A. Translated Instructions

INSTRUCTIONS TO PARTICIPANTS

Introduction

Welcome to our experiment!
During this experiment you will be asked to make several decisions, and so will the other participants.
Please read the instructions carefully. Your decisions, as well as the decisions of the other participants will determine your payoff according to rules, which will be explained shortly. The tokens that you earn during the experiment will be converted to euros at the rate of 1 token = €0.50. In addition to the earnings from your decisions over the course of the experiment, you will receive a show-up fee of €2.50.
Please note that hereafter any form of communication between the participants is strictly prohibited. If you violate this rule, you will be excluded from the experiment with no payment. If you have any questions, please raise your hand. The experimenter will come to you and answer your questions individually.

Once you are ready to begin the experiment, please click on the 'OK' button on the screen. When everyone is ready, the experimenter will read the instructions aloud, and then the experiment will start.

Description of the Experiment

This experiment is fully computerized. You will be making your decisions by clicking on appropriate buttons on the screen. All the participants are reading the same instructions and taking part in this experiment for the first time, as you are.

The experiment is composed by three phases (Phase 1, Phase 2, and Phase 3). Each phase consists of 15 identical rounds, in which you will be required to perform a Task as explained below. The whole experiment hence will consist of 45 rounds.

During the experiment, groups of 2 participants will be randomly formed, and in every round of the same Phase you will be interacting with a different participant (how to interact with the other will be explained shortly). In other words, you will never be interacting more than once with the same participant through the same Phase of the experiment.

Description of the Task

In each round, you and the other will be endowed with nine (9) tokens.
In each round, both you and the other participant will have to take decisions.

(1) Firstly, you, as well as the other, have to decide, individually and independently, how many of the nine tokens you are endowed with you want to contribute to a project.
During the experiment, with some probability you will have the possibility to modify your initial contribution (how to modify the contribution will be explained shortly).
The probability with which you will be able to modify your contribution will be communicated *before* taking your first decision.
The same level of probability applies to you and the other participant you interact with in every single round.
There are three possible levels of probability: you could modify your contribution by 2,5%, 33,3% and 49%.
The level of probability will remain fixed for all the rounds in a given Phase.
In every Phase, the probability will be different, but as explained you will be informed about it before starting the tasks.

(2) Secondly, after every participant has completed the first task, you, as well as the other, have to decide, individually and independently, how much you would like to modify your initial contribution in case you will you will be given the possibility to do so.
More specifically, you will be asked to modify your contribution in the three following situations:

- if the other has contributed to the project more than you;
- if the other has contributed to the project less than you;
- if the other has contributed to the project as much as you.

For each of the three cases, you will be asked by how many tokens you want to modify your initial contribution. You can add at most as many tokens as nine minus your initial contribution. You can subtract at most as many tokens as your initial contribution.
You will be asked by how many tokens you want to modify your initial contribution *before* knowing if the other has contributed more than you, less than you or as much as you.
After all participants have taken the decision regarding the modified contribution, the computer will randomly select if any participant will adapt and

which participant is allowed to modify the initial contribution, and will communicate the outcome to both of you.
Please note that there is always the possibility that neither you nor the other will be allowed to modify.

The computer will work out and communicate to you if and how much your initial contribution will be adapted depending on both yours and the other participant' decisions.

In particular, if you have been selected to adapt, the computer will automatically adapt your contribution on the basis of the decision you have taken before (2) and, given the decision on contribution stated in (1) by the other participant that in the current round is interacting with you, and will show on your screen your payoff for this round.

If instead the other has been selected to adapt, the computer will automatically adapt his/her contribution on the basis of the decision he/she has taken before (2) and, given the decision on contribution stated in (1) by you, and will show on your screen your payoff for this round.

NOTE: The computer ***will not*** *inform you about the size of the initial contribution of the other participant with whom you interact in each round, but it will tell you if his/her contribution has been greater, lower or equal to your initial contribution.*

Summing up, your payoff for each round will depend on:

- your initial decision to contribute (1);
- the probability that you (or the other) have to modify the former decision;
- your decision on how much, if at all, to modify your initial contribution depending on the other's initial decision to contribute;
- the decision of the other on how much, if any, to modify his/her initial contribution to your initial decision to contribute.

Your payoff is determined in each round according to the following formula:

9 – your final contribution + 0.8(your final contribution + the other's final contribution)

The final contribution is the one that you decide in (1), which is adapted according to what you decided in (2) if you are given the possibility to adapt.

Information Feedback

Before proceeding to the next round, the computer will inform you of: (i) your decisions (your initial contribution (1) and your decisions to adapt (2)); (ii) the probability to adapt of the current Phase and the result of the related lottery; (iii) if you or the other participant with whom you interact in this round or none of you, are allowed to adapt your initial contribution; (iv) your payoff for the current round.

End of the Experiment

After completing the experiment, that is when the 45 rounds will be over, a lottery administrated by the computer will randomly select one round for each Phases to be considered for payment and will display it on your screen numbers with the corresponding payoff you made in those rounds.

Your total payoff from the experiment will be equal to the sum of:

- the payoff that you realised in the selected round in Phase 1;
- the payoff that you realised in the selected round in Phase 2;
- the payoff that you realised in the selected round in Phase 3;
- the participation fee.

A summary screen will display the total points you have accumulated and the corresponding earnings in euros. Please remain at your cubicle until asked to come forward and receive payment for the experiment.

After having finished the experiment, but before receiving your payoff, you will be asked also to fill up a short questionnaire about your demographics and other few questions.