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Strong, Bold, and Kind: Self-Control and Cooperation in Social Dilemmas*

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Abstract: We develop a model relating self-control, risk preferences and conflict identification to cooperation patterns in social dilemmas. We subject our model to data from an experimental public goods game and a risk experiment, and we measure conflict identification and self-control. As predicted, we find a robust association between self-control and higher levels of cooperation, and the association is weaker for more risk-averse individuals. Free riders differ from other contributor types only in their tendency not to have identified a self-control conflict in the first place. Our model accounts for the data at least as well as do other models.

JEL: C91, D03, H40

Keywords: self-control, cooperation, public good, risk, experiment

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1. Introduction

Social dilemmas, for instance the private provision of a public good, are characterized by the tension between individual rationality—dictating free-riding for selfish agents—and collective rationality—prescribing cooperation. Team work, voter turnout, tax honesty, and the tragedy of the commons may all be understood as examples of social dilemmas. A substantial body of evidence from laboratory and field studies documents that humans cooperate more than implied by the selfish free-riding equilibrium (for surveys, see, e.g., Ledyard, 1995; Zelmer, 2003; Gächter, 2007; Chaudhuri, 2011). Over the past 20 years, multiple explanations have been proposed for the observed levels of cooperation in social dilemmas—among them the confusion of individuals, altruism, warm-glow, inequity aversion, efficiency preferences, and reciprocity (see, for instance, Andreoni, 1990, 1995; Palfrey and Prisbrey, 1997; Anderson *et al.* 1998; Houser and Kurzban, 2002).

A more recent approach to public goods experiments, initiated by Fischbacher et al. (2001) using the strategy method, has focused on classifying individuals as types of contributors (see also Kelley and Stahelski, 1970; Andreoni, 1988; Keser and van Winden, 2000; Fehr and Schmidt, 2006). The most prominent types in such public goods experiments are conditional cooperators, who increase their contribution with the (expected) contribution of other group members; free-riders, who do not contribute at all; and triangle (hump-shaped) contributors, who increase their contributions to the public good up to a certain level of (expected) others' contributions and then reduce them (see, Herrmann and Thöni, 2009; Kocher *et al.*, 2008; Fischbacher and Gächter, 2010; Volk *et al.*, 2011). Despite some differences in detail, the overall distribution of types is surprisingly robust across studies and locations, with conditional cooperators representing the most frequent type (usually around half of the decision makers or more), followed by free riders (around 20%-30%), and triangle contributors.

The distribution of types, and the multitude of motivations that potentially explain contributions to public goods, make theoretical modeling difficult. Moreover, there is a discrepancy between empirical results and theoretical predictions. For instance, many decision makers contribute intermediate amounts, whereas linear models of other-regarding preferences (e.g., Fehr and Schmidt, 1999) predict corner solutions. Though one may solve the problem by assuming non-linear forms of other-regarding preferences, most existing models have difficulties in explaining certain stylized facts from public goods experiments, such as the decay of contributions over time.[1] One recent theoretical contribution that comes close is Ambrus and Pathak (2011). They develop a model with a reciprocity-flavor, building on Kreps *et al*. (1982). Applying this approach, Ambrus and Pathak (2011) are able to explain many of the stylized facts of repeated linear public goods experiments, such as the decay of cooperation and the re-start effect. Notably, their model requires repeated interaction. However, cooperation has also been documented widely for one-shot public goods games.

The aim of this paper is to contribute to the literature on cooperation motives in social dilemmas. We propose a different route than that taken in the existing literature, which has almost exclusively examined preferences. In contrast, we present a model of rational self-control, which captures the conflict between cooperative (pro-social) and selfish behavior, and which lends itself to straightforward application in social dilemmas.[2] Our setup is similar to dual-self models (e.g., Fudenberg and Levine, 2006), but there are notable differences. We model the conflict between free-riding and contributing to the public good as a two-stage decision problem, with an identification stage and a contribution stage; willpower—self-control effort[3]—and risk preferences together determine the stochastic success of the internal contest between selfish and cooperative behavior—which ultimately leads to cooperation if the contest is won, or to defection if the decision maker gives in to the temptation of keeping his or her entire endowment.

Our model yields predictions that we test in the laboratory by implementing a linear public goods game, amended by eliciting risk preferences, and measuring trait self-control, and the perception of conflict. Individuals, who report in our experiment that they experience conflict, contribute significantly more if their level of self-control is high. Moreover, controlling for self-control levels, a higher level of risk aversion is associated with relatively lower levels of contributions, because the outcome of the internal conflict is uncertain. That is, more risk-averse individuals more likely avoid taking on the internal struggle between free-riding and cooperation. Finally, free-riders are much less likely to experience conflict than are conditional cooperators.

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[1] Obviously, a learning model with boundedly rational, selfish agents can account for the decay over time, but it is at odds with the high fraction of conditional cooperators observed.

[2] A self-control problem is characterized by an intrapersonal conflict between "better judgment" and "temptation" (e.g., Thaler and Shefrin, 1981; Schelling, 1984; Loewenstein, 1996). In many circumstances (though not all), there is reason to believe that an individual may maintain the better judgment to act pro-socially, but simultaneously feel tempted to act selfishly (compelled by the impulse colloquially known as "greed").

[3] We use the terms "willpower" and "self-control (effort)" synonymously.

We see our model and its implications as complementary to existing models that try to understand motives of cooperation in social dilemmas. However, our model may capture in a more convincing manner several behavioral regularities from public goods experiments. Of course, we are not the first linking self-control and the struggle between pro-social and selfish behavior in general. Loewenstein (1996; 2000) suggests that selfish behavior may be motivated by visceral urges or drive-states, resembling cravings for relief of hunger, pain, and sexual deprivation. O'Donoghue and Loewenstein (2007) argue that such selfish urges may often conflict with the "colder", more abstract preferences for altruism, as visceral urges for sweets could conflict with more abstract preferences for a fine figure or good health. In the context of the private provision of public goods, for instance individuals asked for a charity contribution might feel torn between the moral obligation to "give something back" and the temptation to keep the cash for private consumption. Likewise, a team member may feel conflicted between the better judgment to contribute to team effort and the urge to free-ride on the efforts of others.[4]

Only quite recently has the empirical literature started to explore in the context of public goods provision how the question of pro-social versus selfish behavior relates to those of self-control and time preferences. Curry *et al.* (2008) find in a public goods game that individuals' discount rates are negatively associated with their contribution to the public account. That is, more impatient individuals contribute less to the public good than do patient ones. Moving to the field, Fehr and Leibbrandt (2011) combine laboratory data on time preferences, as well as extraction in a common pool resource problem, with field data on the catches of fishermen in Brazil. Their data indicate that those in the experiment who exhibit more cooperative and less impatient behavior are in the field less likely to over-exploit the common pool resource.[5]

There is also a nascent literature on the effects of self-control depletion on behavior in the ultimatum game. Achtziger *et al.* (2011) show that proposers, whose self-control resources are

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[4] Notably, O'Donoghue and Loewenstein (2007) also suggest the possibility that self-control conflict may stand between an urge to be altruistic (for example, by empathy toward a beggar) and better judgment to act selfishly (for example, knowing that the beggar will squander the money for drugs). Recent evidence by Andreoni *et al.* (2011) on solicitor avoidance shows that this reverse temptation seems to be important in the context of charitable giving. We do not rule out reverse temptation, but deem it the less plausible of the two in our (anonymous and abstract) laboratory experimental setting. We address the issue in our concluding section.

[5] For consistent results in experimental psychology, see Pronin *et al.* (2008) and Sheldon and Fishbach (2011).

depleted, make lower offers; they become relatively more selfish. Responders with depleted self-control resources are more likely to reject offers that are unfair to themselves. Halali *et al.* (2011) provide consistent results for responders, but with a different depletion task.

We are the first to formalize and study the link between self-control and cooperation in a public goods game. We build on the design of Fischbacher et al. (2001), which, in a standard linear public goods environment, elicits conditional contribution schedules through a variant of the strategy vector method (Selten, 1967), together with an unconditional contribution and an expectation of others' contributions. Our setup allows us to study specific aspects of self-control and also its interaction with risk preferences, as well as the perception of conflict. Furthermore, we may in our data analysis associate behavioral types with levels of self-control.

The remainder of the paper is organized as follows. Section 2 introduces our model, and Section 3 explains our experimental design. We present in Section 4 the experimental results. Section 5 discusses our findings and concludes the paper.

2. The Model

We propose a two-stage model with a conflict identification stage (perception of conflict) and a contribution stage (unraveling of the conflict). In the model, nature decides in the first stage whether or not an agent identifies the conflict. If the conflict is not identified, the decision process ends, and the agent contributes zero. If it is identified, the agent decides how much effort to invest in the self-control conflict.

More formally, we assume that the generalized utility function *U* of individual *i* is given by

$$U_i = x_i^{\alpha} + \tau_i c_i, \quad (1)$$

where x_i is the individual*'s monetary payoff,* which depends on the public good technology and on contribution costs (i.e., $x_i^{\alpha} = f(c_i, G(\cdot))$; where *G* denotes the public technology); $c_i \geq 0$ is individual $i's$ contribution to the public good; $\tau_i = \tau_i(\overline{c})$ with $\tau'(\overline{c}) \geq 0$ measures the agent's sensitivity towards utility derived from contributing to the public good; $\overline{c}$ is the (expected) average contribution of other group members; and $0 < \alpha < 1$ renders the utility function concave

(α may be interpreted straightforwardly as a parameter of risk aversion).[6] One may see that our utility function incorporates other-regarding concerns in a way similar to that of warm-glow, altruism, or reciprocity models. Regarding the public good technology, we assume that

$$\frac{\partial G(\cdot)/\partial c_i}{n} < \partial G(\cdot)/\partial c_i < 1 < n \cdot \partial G(\cdot)/\partial c_i \,, \qquad (2)$$

with n representing the group size. Condition (2) ensures that the problem is a social dilemma—as the selfish individual optimum and the collective optimum are in conflict.

The decision problem involving self-control effort of individual i is illustrated in Figure 1, with payoffs at the end of each branch of the decision tree. For the sake of a straightforward exposition, we display the decision problem for two discrete contribution levels, with $c_i^+ > c_i$, implying *ceteris paribus* $x_i(c_i^+) < x_i(c_i)$. However, the extension to a larger number of discrete contribution levels, and to continuous distribution levels, is straightforward.

At the conflict stage, decision makers may choose levels of self-control effort. The cost of this effort is defined linearly, with e_i / ω_i, where $e_i \geq 0$ denotes individual cost of self-control effort, and $\omega_i \geq 0$ represents a willpower parameter.[7] Notably, for any given effort level less than infinity, the individual cannot know with complete certainty the outcome of the self-control conflict.[8]

Insert Figure 1 around here

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[6] The exact specification does not matter for our results.

[7] Self-control effort can be thought of as a concept similar to that of *ego resources* in the work by Baumeister and colleagues (see, e.g., Baumeister, 2002).

[8] We use what we consider to be the most parsimonious model that preserves stochastic determination of behavior following self-control conflict. Our model is similar to that by Fudenberg and Levine (2006), who study the interaction between a short-run "self" and a long-run "self". Alternatively, it can be understood as a stochastic version of that by Gul and Pesendorfer, (2001; 2004), as in Bénabou and Pycia (2002). Because the focus of this paper is not only theoretical but also empirical, we refrain from a detailed discussion regarding the similarities and differences between the available models. The interested reader is referred to Myrseth and Wollbrant (2011).

We demonstrate next how the individual responds to self-control conflict and how the conflict is resolved.

Identification stage

At the identification stage, nature decides whether or not the agent identifies conflict. The binary identification function $\varphi = \{0,1\}$ implies conflict identification when $\varphi = 1$, and no conflict identification when $\varphi = 0$. The model has a trivial solution in the case of $\varphi = 0$; the agent does not identify conflict and hence contributes nothing.[9]

Conflict stage

At the conflict stage, when $\varphi = 1$, the agent makes two decisions: she must determine (i) the level of contribution, c_i, to be attempted and (ii) the level of self-control "effort" to be exerted in the service of this attempt, denoted $e_i \geq 0$.[10]

In accordance with our empirical paradigm, we restrict attention to discrete contributions $c_i \in [0, C]$. For the agent to experience a self-control conflict—to want to contribute $c_i^+ > c_i$ but simultaneously feel compelled not to give at all—we require that $f(c_i^+, G(\cdot)) + \tau_i c_i^+ > f(c_i, G(\cdot)) + \tau_i c_i$. The agent will experience a stronger selfish impulse for higher contribution levels. This is because the agent stands to lose more. We may thus characterize temptation strength by the function $t = t(c_i)$, with $t'(c_i) \geq 0$ and $t''(c_i) \geq 0$ Hence, we conclude that $t(c_i^+) > t(c_i)$.

Every positive contribution level thus specifies a degree of temptation strength against which the agent by exerting costly effort may struggle. For the agent to be willing to take on $t(c_i^+) > t(c_i)$, we require the following:

[9] It is of course possible that a contributor does not even think of free-riding and, therefore, contributes the entire amount without experiencing conflict. In the spirit of parsimony, we abstract from such cases.

[10] Our model does not to make claims about the behavioral process by which individuals optimize their choices. Rather, our model serves as an "as-if"-representation of the decision problem. We recognize that the actual behavioral process might be imperfect, bounded by cognitive constraints and guided by heuristics.

CONDITION 1: *The utility from contributing* c_i^+ *is greater than that from contributing* c_i, $f(c_i^+, G(\cdot)) + \tau_i c_i^+ > f(c_i, G(\cdot)) + \tau_i c_i$.

When Condition 1 does not hold, an agent would not even attempt a higher contribution level. The final outcome of any given conflict is determined stochastically by the probability measure $p = p(e_i, t)$, such that $p(e_i, t(c_i^+)) < p(e_i, t(c_i))$, and, where $e_i^H > e_i^L$, $p(e_i^H, t) > p(e_i^L, t)$. That is, the probability that the agent succeeds in her struggle, and thus contributes to the public good, increases in effort and falls in temptation strength. Finally, we have $p(0,t) = 0$ for $t > 0$ and $p(\infty, t) = 1$, for all *t*. Solving the model backwards yields the following results.

CONDITION 2: *Given that the agent has identified conflict* $\left(\varphi = 1; f(c_i^+, G(\cdot)) + \tau_i c_i^+ - \left(f(c_i, G(\cdot)) + \tau_i c_i\right) > 0\right)$, *a necessary condition for higher contributions is that*[11]

$$\underbrace{\omega_i \left(p^H - p^L\right)\left(f(c_i^+, G(\cdot)) + \tau_i c_i^+ - \left(f(c_i, G(\cdot)) + \tau_i c_i\right)\right)}_{\text{Expected marginal benefit of contributing } c_i^+ > c_i} \geq \underbrace{e_i^H - e_i^L}_{\text{Marginal cost of contributing } c_i^+ > c_i} \qquad (3)$$

Proof. All proofs can be found in Appendix A.

The condition in (3) states that the expected marginal benefit (left-hand side) from a higher contribution, $\omega_i \left(p^H - p^L\right)\left(f(c_i^+, G(\cdot)) + \tau_i c_i^+ - \left(f(c_i, G(\cdot)) + \tau_i c_i\right)\right)$, must exceed or equal the marginal cost of effort, $e_i^H - e_i^L$, where p^H denotes the probability of succeeding in the struggle against temptation to contribute c_i^+, and p^L denotes the probability of succeeding in the attempt to contribute c_i. Note that the benefit of a higher contribution is positive whenever

[11] Equivalently, the willpower parameter in equation (3) could of course be moved to the right-hand side of the equation. Although it seems a bit counter-intuitive at first sight, we prefer this presentation for analytical and expositional convenience as illustrations are more straightforwardly interpretable (see Figure 2) and proofs of predictions simpler to derive.

the agent has not reached the maximum on her utility function, i.e., whenever $f(c_i^+, G(\cdot)) + \tau_i c_i^+ - \left(f(c_i, G(\cdot)) + \tau_i c_i \right) > 0$. However, higher contribution levels also yield a stronger temptation not to contribute at all, the struggle against which requires greater effort (right-hand side).

We next present a series of comparative statics results that will be tested empirically later.

PROPOSITION 1: *Increasing willpower raises the expected marginal benefit of contributing, thus weakly increasing contributions.*

The proposition follows from the left-hand side of Condition 2. Raising willpower increases the expected marginal benefit from attempting to contribute $c_i^+ > c_i$. Whether the agent actually contributes more, depends, first, on whether the necessary condition in (3) is satisfied, and, second, on whether she defeats her urges. Thus, raising willpower increases contributions whenever the additional willpower causes Condition 2 to hold. Of course, for stronger individuals, for whom Condition 2 is already satisfied, raising willpower will not influence contributions. Moreover, for some weaker individuals the additional willpower may not prove sufficient to satisfy Condition 2. Taken together, we conclude *ceteris paribus* that an individual with higher willpower in expectation will contribute *no less* than an individual with lower willpower (see Figure 2). That is, raising willpower yields weakly larger contributions. Thus, we expect a positive correlation between willpower and contributions to the public good.

PROPOSITION 2: *Given that the agent has identified conflict* ($\varphi = 1$), *raising willpower ω implies a smaller increase in contributions if risk aversion increases (α falls).*

As before, there is an increase in utility from contributing more whenever the agent is not at the maximum of her utility function. However, this given increase in expected utility decreases when risk aversion increases. As seen on the left-hand side of (1), $\omega_i \left(p^H - p^L \right) \left(f(c_i^+, G(\cdot)) + \tau_i c_i^+ - \left(f(c_i, G(\cdot)) + \tau_i c_i \right) \right)$, increasing risk aversion reduces the distance between $f(c_i^+, G(\cdot)) + \tau_i c_i^+$ and $f(c_i, G(\cdot)) + \tau_i c_i$, rendering the condition more difficult to satisfy. Hence, the positive effect of willpower on contributions diminishes with a higher level of risk aversion.

A higher level of risk aversion leads to a downward rotation in the marginal benefit curve as the slope of the curve decreases (see Figure 2). The same individuals, whose increase in willpower was just sufficient to satisfy Condition 2, may now prefer not to attempt the higher contribution level.

PROPOSITION 3: *Given that the agent has identified conflict* ($\varphi = 1$), *raising willpower* ω *implies a larger increase in contributions for higher levels of the others' average contribution.*

Recall that the social utility parameter τ_i increases with $\bar{c}$, the other group members' average contribution level ($\tau_i = \tau_i(\bar{c})$, $\tau_i'(\bar{c}) \geq 0$). Thus, the expected marginal benefit of contributing increases when others contribute more. In turn, this implies that higher levels of others' average contributions increase the distance between $f(c_i^+, G(\cdot)) + \tau_i c_i^+$ and $f(c_i, G(\cdot)) + \tau_i c_i$, rendering Condition 2 easier to satisfy. When others raise their contribution levels, the slope of the marginal benefit curve increases, implying an upward rotation of the curve (see Figure 2). For some of the individuals for whom the increase in willpower alone is not sufficient to raise contributions, higher contributions by others render the additional willpower sufficient to satisfy Condition 2.

PROPOSITION 4: *Given that the individual has identified conflict* ($\varphi = 1$), *raising willpower* ω *yields a smaller contribution increase from increases in the level of others' average contribution if risk aversion increases* (α *falls*).

Proposition 4 is a combination of Propositions 2 and 3. Increasing risk aversion first reduces the slope of the marginal benefit curve, and increasing the level of others' average contribution increases it (See Figure 2).

Insert Figure 2 around here

Having outlined the model and derived the main predictions, we next present the experimental design and procedure.

3. Experimental Design and Procedure

3.1 The Basic Public Goods Game and the Strategy Vector Method

In our experiment, the public goods game builds on the following linear payoff function for individual *i*

$$x_i = 20 - \tilde{c}_i + 0.4\sum_{j=1}^{n}\tilde{c}_j, \tag{4}$$

where $\tilde{c}_i$ denotes the contribution of individual *i* to the public good. Each group consists of four randomly matched individuals, and each individual receives an endowment of 20 experimental points (the experimental currency unit). The marginal per capita return (MPCR) from investing in the public good is 0.4, fulfilling the conditions for a social dilemma. Assuming that participants are rational and self-interested, it is evident that any MPCR < 1 yields a dominant strategy to free-ride. From the perspective of social welfare, it is optimal to contribute the whole endowment because $\text{MPCR}\cdot n > 1$.

The preference elicitation and the incentive mechanism in our experiment closely follow Fischbacher *et al.* (2001). More specifically, participants are asked to make two decisions: first, to make an unconditional contribution to the public good, and, then, to submit a conditional contribution schedule. The unconditional contribution is a single integer number that satisfies $0 \leq \tilde{c}_i \leq 20$. For the conditional contribution, subjects participants indicate how much they would contribute to the public good for any possible average contribution (rounded to integers) of the other three players within their group. For each of the 21 possible averages from 0 to 20, participants must decide on a contribution between (and including) 0 and 20. This is a variant of the strategy vector method (Selten, 1967).

To ensure incentive-compatibility, both the unconditional and the conditional contributions are potentially payoff-relevant. For one group member, randomly determined by the toss of a four-sided die,[12] the conditional contribution is relevant; their unconditional contributions are relevant for the other three group members. More specifically, the three unconditional contributions within a group, and the corresponding conditional contribution (for the specific average of the three unconditional contributions), determine the sum of contributions

[12] Each group member is assigned a number from one to four. The die is rolled by a randomly selected participant in the session, and the roll of the die is monitored by the experimenter.

to the public good. One can then according to equation (4) straightforwardly compute individual earnings.

In addition, participants are asked to guess the average unconditional contribution of the other three group members (rounded to integers). The guessing stage is implemented after the contribution stages and is not mentioned in the written instructions. As in Gächter and Renner (2010), participants are monetarily rewarded depending on the accuracy of their guesses. However, we use a slightly stronger incentive mechanism. If a participant's guess equals exactly the average unconditional contribution of the other three group members, the participant earns nine additional points from the guess; if there is a difference of one between the guess and the average, the participant earns six additional points; and a difference of two results in additional three points earned. Larger differences are neither rewarded nor punished.

3.2 Elicitation of Risk Preferences

We employed the design by Holt and Laury (2002) to measure individual risk preferences. Each participant, without interacting with another participant, is required to make ten risky choices. For each choice, participants choose between two options, labeled X and Y. Both options include a lottery with the same probabilities, but with different payoffs. Option X is the relatively safer option; its highest outcome is lower than the highest outcome from option Y, but its lowest outcome is higher than the lowest outcome from option Y. Payoffs are fixed throughout the choice sequence. However, in both options the probability of receiving the higher payoff increases by ten percentage points, from 10% in decision 1 to 100% in decision 10.[13]

As the participant moves down the sequence of choices, depending on the participant's preference for risk, the participant at some point may switch from Option X (the relatively safe choice) to Option Y (the relatively risky choice). In the case of extreme risk-loving, the participant would always choose Option Y. Switching from Y to X, or always choosing X is incompatible with consistent money-maximizing behavior.[14] One can compute an individual's

[13] We provide the specific numbers used for this risk elicitation procedure in Appendix D.

[14] We have excluded fifteen subjects from our analysis that did not provide consistent answers in the risk experiment. Conducting the analyses in our results section without excluding inconsistent subjects, where risk preferences were measured as the number of safe choices, leaves our results unaffected.

degree of risk aversion by using the point at which he or she switches from Option X to Option Y.[15]

Upon completing this task (and the rest of the experiment), one of the ten lotteries is selected randomly and played for real. All lotteries are thus potentially payoff-relevant, and participants could in this part earn up to 3.85 euro.

3.3 Measurement of Conflict Identification and of Trait Self-Control

After risk preference elicitation, we implement a standard measure of trait self-control: the Rosenbaum Self-Control Schedule (1980a), henceforth abbreviated RSS.[16] This measure has been validated against a battery of relevant personality measures, and against behavioral tasks associated with self-control, such as resisting pain (Rosenbaum, 1980b), coping with stress (Rosenbaum and Smira, 1986; Rosenbaum 1989), coping with mental disability (Rosenbaum and Palmon, 1984), coping with seasickness (Rosenbaum and Rolnick, 1983), quitting smoking (Katz and Singh, 1986), saving over spending (Romal and Kaplan, 1995), and curtailing procrastination (Milgram *et al.*, 1988).

We build on the finding from personality psychology that the tendency to apply self-control strategies represents a stable trait within the individual over time. Indeed, the tendency to apply self-control strategies remains remarkably consistent throughout life. For example, Mischel and colleagues found that a child's performance at age 4 on an instant gratification task (one cookie now, or two cookies later) predicted later in life their cognitive control (Eigsti *et al.*, 2006), ability to concentrate, self-control, interpersonal competence, SAT scores, and their drug use (Mischel *et al.* 1988; Mischel *et al.*, 1989; Shoda *et al.*, 1990; Ayduk *et al.*, 2000).

Critically, self-control strategies[17] are relevant to the decision to indulge only when the individual has identified self-control conflict. Therefore, one approach to investigating whether the problem of pro-social versus selfish behavior resembles one of self-control is to test whether self-control strategies are positively associated with pro-social behavior when the individual has

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[15] Switching points can readily be converted into risk aversion parameters of parametric models, such as CRRA. Since the choice of a model would be arbitrary, we use the switching point as a model-free measure in our analysis.

[16] The Rosenbaum Self-Control Schedule (1980a) is included in Appendix B.

[17] Such self-control strategies may take a variety of forms, and common examples include counteractive self-control (e.g., Trope and Fishbach, 2000; Myrseth and Fishbach, 2009), and pre-commitment (e.g., Thaler and Shefrin, 1981; Schelling, 1984).

felt conflicted, but less so or not at all when the individual has not. It is, therefore, necessary to measure experienced conflict. To capture recollection of feelings of mixed emotion, we employ a question in the last part of the experiment (but before administering the RSS) that is similar to the one used in Aaker *et al.* (2008): *"To what extent did you experience conflict when deciding how much to contribute?"* Participants answered this question on a continuous scale ranging from 0 ("not at all") to 100 ("very much"). The question obviously captures subjectively experienced strength of conflict.[18]

3.4 Experimental Procedure

The computer-based experiment was conducted at the experimental laboratory MELESSA of the University of Munich in October 2009 and in March 2010, using the experimental software z-Tree (Fischbacher, 2007) and the organizational software Orsee (Greiner, 2004). 144 undergraduate students from all disciplines, except economics, participated in six sessions, each with 24 participants. Approximately 62% of participants were female. Sessions lasted up to 1½ hours, and the average payoff was 13.4 euro, including a show-up fee of 4 euro.[19]

Upon arrival, experimental participants were seated in separate cubicles. Each session started with instructions for the public goods game. At this stage it was made clear that there would be additional parts of the experiments, but that the instructions for these parts would only be handed out after the completion of the current part. It was also stressed to participants that decisions in one part would be completely unrelated to those in the other parts. Participants received neutrally-framed, written instructions (see Appendix C), which were read aloud. Everybody had the opportunity to ask questions in private. The experiment continued only after all participants had completed a series of computerized exercises (where they calculated profits for different contribution levels in the public goods game), and after all participants had correctly understood the procedures. It was made very clear that feedback and profit information would only be given at the very end of the experiment. This was done to reduce the potential spillover effects of earnings, from one part of the experiment to the next.

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[18] Several alternative measures for conflict identification are conceivable, including physiological ones. It is interesting to note that response time for the contribution decision in our experiment—which is an obvious candidate for an alternative measure of conflict identification—is not significantly correlated with our self-reported measure.

[19] Each experimental point earned in an experimental session is exchanged at the pre-announced rate of 1 point = 0.33 euro.

Upon completing the public goods game (part 1), participants received instructions for the risk preference elicitation (part 2). Results from part 3—a variant of the trust game—are reported in Kocher *et al.* (2011), who analyze the association between cooperation, trust, and risk. After part 3, participants answered the conflict experience question, the RSS and a couple of questions regarding socio-demographics and individual background.

The final stage of the experiment included extensive feedback on the decisions of group members in the public goods game, chance moves, and the individual earnings. Payments were made privately and in cash.

4. Experimental Results

We hypothesized that self-control would positively correlate with contributions to the public good for individuals who had identified a self-control conflict between better judgment to cooperate and the temptation to be selfish. We did not expect a significant correlation for individuals who had not identified conflict. The RSS represents our proxy for self-control, and a dummy variable, extracted from participants' self-reports of conflict intensity, represents our proxy for participants' identification of self-control conflict.

While the response variable for conflict intensity is continuous, there is no reason to expect a linear effect of experienced conflict on the impact of trait self-control. Rather, a threshold effect of the former on the latter seems more appropriate; individuals who identified self-control conflict would draw on their self-control strategies to promote pro-social behavior, whereas individuals who did not would not (see Figure 1). A natural, theoretically motivated threshold for our analysis would, therefore, be the lowest positive, non-zero report of experienced conflict (identification). Our conflict dummy, therefore, takes the value of zero for participants reporting no conflict ("0" on the conflict intensity question), and 1 otherwise.[20]

Insert Table 1 around here

[20] Our subsequent pattern of results, though slightly weaker, is robust with respect to the alternative threshold of 50, which corresponds to the midpoint of the scale. Similarly, the pattern obtains when using conflict as a continuous independent variable in a regression (see Appendix E). We prefer to present the data by using a dichotomous variable, with 1 as the threshold, as this is most closely aligned with our theory.

The summary statistics in Table 1 reveal that both unconditional and conditional contributions in our sample resemble those reported in the related literature (e.g., Fischbacher et al., 2001; Fischbacher and Gächter, 2010). Moreover, the RSS scores of our participants appear roughly similar to those found in other studies: the standard deviation is within the range of those found in the original samples studied by Rosenbaum (1980a, b), but the mean is slightly below the corresponding range of means (16.7 vs. a range of 23 to 27). Overall, our summary statistics do not suggest anything out of the ordinary.

4.1 Conditional Contributions in the Public Goods Game

We start by examining contribution schedules. Remember that each of our participants had to indicate 21 contribution levels for all possible average contribution levels (rounded to integers) of the other group members. The elicitation of the schedule was fully incentivized. Table 2 tests our four propositions from the model based on the conditional contribution data. More specifically, it presents an OLS analysis[21] of conditional contributions as a function of RSS scores (denoted *RSS*), risk preferences based on the switching point in the choice list task (denoted *Risk*), average contributions by others (denoted *Others*), and the respective interaction terms. We have split the estimations based on whether an individual has identified self-control conflict (specifications (6)-(10), based on 99 individuals) or not (specifications (1)-(5), based on 30 individuals).[22] Specifications (1)-(4) and (6)-(9) all replicate a commonly found pattern: the level of others' average contributions is a strong determinant of own contributions (e.g., Fischbacher and Gächter, 2010; Gächter, 2007; Kocher *et al.*, 2008). It is noteworthy that this variable does not appear significant in specifications (5) and (10), a point to which we shall soon return.

Insert Table 2 around here

[21] We present here and hereafter only OLS regressions but our pattern of results also holds for Tobit regressions that account for the lower and the upper contribution limits; see Appendix E for robustness checks.

[22] When we control for risk attitude, we lose several observations due to inconsistent choice patterns in the Holt-Laury-task. Note that we have 21 observations per individual, and we report robust standard errors to account for the dependence in the data.

Consistent with Proposition 1, specifications (7) and (9) yield positive and significant correlations between conditional contributions and RSS for those who have identified conflict; no such positive correlation is obtained in specifications (2) and (4) for those who reported not having identified conflict. Moreover, and consistent with Proposition 2, specification (9) yields a negative coefficient on the interaction term between RSS and risk preferences for those who have identified conflict; this coefficient is, however, not significant at conventional levels. That is, the positive association between RSS and conditional contribution seems to be slightly weaker for more risk-averse individuals, but for the time being one should not over-interpret this result. Risk preferences themselves are never a significant predictor of conditional contributions. This is not surprising because conditional contributions do not involve strategic uncertainty.

Specification (10) pertains to individuals who identified self-control conflict, and it includes all aforementioned variables and the respective interactions. Consistent with Proposition 3, the interaction between RSS and Others is positive and significant. That is, the greater is the level of others' average contributions, the stronger the positive association between self-control and conditional contributions. This result is not obtained for specification (5), which includes only those who did not identify self-control conflict. We summarize our findings for conditional contributions in Results 1, 2, and 3—corresponding to Propositions 1-3, respectively.

RESULT 1: *Conditional contributions are positively correlated with self-control, for individuals who have experienced conflict.*

RESULT 2: *The positive correlation between conditional contributions and self-control diminishes weakly, but not significantly, as risk aversion increases, for individuals who have experienced conflict.*

RESULT 3: *The positive correlation between conditional contributions and self-control becomes stronger as the level of others' average contribution increases, for individuals who have experienced conflict.*

Furthermore, specification (10) yields support for Proposition 4. The three-way interaction between RSS, risk preferences, and Others is negative and significant. In other words, with a higher level of others' average contributions, there is a weaker association between self-control and conditional contributions for more risk-averse individuals. Again, we do not obtain the result from specification (5), which includes only those who did not experience self-control conflict.[23] We summarize the finding in Result 4, corresponding to Proposition 4 in the theoretical section.

RESULT 4: *With higher average contributions by others, the strength of the positive correlation between conditional contributions and self-control diminishes with higher levels of risk aversion, for individuals who experienced conflict.*

To illustrate the results from specification (10), we plot in Figure 3 the unit increase in conditional contribution, from a one-standard-deviation increase in RSS, at different levels of risk preference and others' contributions. At low levels of Others, there is little difference in conditional contribution for various levels of risk preferences. Similarly, at high levels of risk aversion, there is little difference in conditional contribution for various levels of Others. However, a one-standard-deviation increase in RSS yields higher levels of conditional contribution when there are both lower levels of risk aversion and higher levels of Others.

Insert Figure 3 around here

The main effect for Others, but also the significant effects of RSS and the interaction of RSS with Risk, statistically disappear in specifications (5) and (10). It seems that if one includes the interaction in the regression, the direct effects become weaker and even non-significant because the interaction coefficients take over. Therefore, it is important to obtain further support for our main results. Before we do that by analyzing unconditional contributions (in Section 4.3), we first take a closer look on different contributor types.

4.2 Types of Contributors in the Public Goods Game

We followed the standard approach in classifying four types of contributors (see Fischbacher et al., 2001; Fischbacher and Gächter, 2010). *Conditional cooperators* submitted a contribution

[23] We have for expositional purposes decided to split the data according to conflict identification. When instead aggregating the data and including in the specifications a dummy for conflict identification, the same patterns obtains. When we interact the conflict dummy with the relevant variables, the interactions are significant and confirm the results in Tables 2 and 4. However, such specifications are more cumbersome to interpret, in particular the four-way interaction between conflict identification, RSS, risk preferences, and Others.

schedule displaying a (weakly, with at least one strict step) monotonically increasing contribution for an increasing average contribution by the other group members.[24] *Free-riders* were characterized by zero conditional contributions for every possible average contribution by the other members. *Hump-shape contributors* (also known as *triangle contributors)* exhibited (weakly, with at least one strict step) monotonically increasing contributions up to a certain average level of others' contributions, above which their contributions schedule is (weakly, with at least one strict step) monotonically decreasing. The category referred to as *Residual* constitutes the remaining participants.[25] The distribution of types based on our data and shown in Table 3 corresponds to those found in past studies (e.g., Fischbacher *et al.*, 2001; Kocher *et al.*, 2008; Herrman and Thöni, 2009; Fischbacher and Gächter, 2010).

Insert Table 3 about here

Given that free-riders by definition contribute less than do other types, which they of course also do in our experiment, and given that they happened to have about the same RSS score[26], and about the same risk preferences, our model would imply that they were less likely to identify a self-control conflict between keeping the money and contributing. Consequently, the model would predict that free-riders were less likely to have drawn on their self-control strategies to promote pro-social behavior. Indeed, consistent with this implication, free-riders reported a significantly lower average level of conflict than did other types (p-values < 0.01; Mann-Whitney-U-tests[27]). In other words, free riders seem to have contributed less because they were less likely to see a self-control conflict in the first place and were, therefore, less likely to draw on

[24] We also included those without a weakly monotonically increasing contribution, but with a highly significant (p-value < 0.01) positive Spearman rank correlation coefficient between own and others' contributions (see Fischbacher et al., 2001; Fischbacher and Gächter, 2010).

[25] We elect not to label this category *Others*, as is conventional in the literature, because this label is identical to the one that we have employed in our regression analyses of conditional contributions. To avoid confusion, we instead refer to the residual class of contributor types as *Residual*.

[26] The RSS of free-riders is not significantly lower than that of either conditional cooperators or hump-shape contributors (all p-values > 0.4).

[27] All non-parametric tests in this paper are two-sided.

their self-control strategies to promote pro-social behavior. We summarize this finding for contributor types in Result 5.[28]

RESULT 5: *Free riders experience lower levels of conflict than do other types, but they do not hold different risk preferences or scores on the self-control measure (RSS).*

Finally, though not too surprising given our findings so far, it is worth mentioning that the self-serving bias of conditional cooperators (i.e., the difference between perfect conditional cooperation—one's own contribution being equal to the (expected) average contribution of the other group members—and the actual conditional contribution of an individual) is related to trait self-control. In a regression also controlling for risk preferences, a higher level of self-control exhibits a strong and significant ($p < 0.01$) negative association with the size of the individual self-serving bias of conditional cooperators.[29] Many conditional cooperators exhibit a self-serving bias, and it is intuitively obvious that its size is related to self-control

4.3 Unconditional Contributions in the Public Goods Game

Our experiment elicited conditional and unconditional contributions to the public good. While we deem the contribution schedule (conditional contributions) more suitable for testing our hypotheses, examining participants' unconditional contributions could provide valuable robustness checks. A first straightforward analysis of the data reveals the predicted association between RSS and cooperation also for participants' unconditional contributions. When comparing the means of unconditional contributions by high vs. low RSS scores (above vs. below the mean) and by experienced conflict vs. no conflict among participants who reported conflict, those with high RSS scores contributed more (on average, 8.94) than did those with low RSS scores (2.86). The difference is highly significant (p-value < 0.01; Mann-Whitney-U-test). However, among participants who did not report having identified conflict, those with high RSS scores did not contribute significantly more (5.53) than did those with low RSS scores (6.93) (p-value = 0.13; Mann-Whitney-U-test).

[28] The result provides ex-post evidence for the assumption in our model that no conflict identification implies no contribution.

[29] The regression table is available on request.

Insert Table 4 here

Table 4 presents OLS regressions for unconditional contributions as a function of RSS scores, risk preferences, and the interaction between the two. As with conditional contributions, we have split the estimations based on whether individuals identified self-control conflict (specifications (14)-(16)) or not (specifications (11)-(13)). Consistent with Proposition 1, specifications (14) and (15), which exclude the interaction term, reveal that RSS is positively correlated with unconditional contributions for individuals who identified self-control conflict; the corresponding specifications (11) and (12) even show a significantly negative correlation between RSS and unconditional contributions. That is, given that somebody identified a self-control conflict, individuals with higher trait self-control, of which RSS is our measure, contributed more to the public good than did those with lower trait self-control.

Specification (16) includes the interaction term between RSS and risk preferences, and it includes only those who have identified self-control conflict. Consistent with Proposition 2, the coefficient for RSS is positive and significant, and the coefficient on the interaction term for RSS and risk preferences is negative and significant. In other words, the positive association between RSS and unconditional contributions is weaker for more risk-averse individuals. The corresponding estimation for individuals who did not identify conflict, specification (13), reveals no clear pattern. We summarize these findings for unconditional contributions, which reinforce our conclusions from Section 4.1, in results 6 and 7, corresponding to Propositions 1 and 2.

RESULT 6: *Unconditional contributions are positively correlated with trait self-control, for individuals who experienced conflict.*

RESULT 7: *The positive correlation between unconditional contributions and self-control diminishes with higher levels of risk aversion, for individuals who experienced conflict.*

Propositions 3 and 4 are more difficult to test with data on unconditional contributions. Because we have elicited expectations of others' contributions immediately after asking for unconditional contributions, the data are less suited than are the conditional schedules. This is mainly because of a potential influence of unconditional contributions on expectations through anchoring or through the false consensus effect (Gächter, 2007). Nevertheless, the impact of self-control (i.e., the RSS score) remains significant and strong for almost all specifications. However, the interactions of risk preferences with the RSS and expectations with the RSS, while displaying the correct signs, are often not significant at conventional levels.[30] Note finally that the coefficient on Risk alone does not explain unconditional contributions in any significant way, corroborating results in Kocher *et al.* (2011).

5. Discussion and Conclusion

We have explored the hypothesis that individuals, when determining whether to contribute to a public good, may experience a self-control conflict between acting in self-interest and acting in the interest of others. To this end, we have developed a model, from which we have derived and empirically tested a series of predictions. Our results clearly indicate that a measure of self-control is positively associated both with conditional and unconditional contributions in a linear public goods game. Moreover, as predicted, there is a weaker association between self-control and cooperation (stronger for unconditional than for conditional contributions) for more risk-averse individuals. As further predicted, we find that higher levels of others' average contributions strengthen the association between self-control and conditional cooperation. The aforementioned results—in line with our model—are obtained only for individuals who reported feeling conflicted during the allocation task. We further study the distribution of contributor types and behavioral determinants for the classification. Our analysis reveals that free-riders are similar to other types both in their levels of self-control and in their risk preferences, but differ in their reported experience of conflict; free-riders seem to have cooperated less because they were less likely to see a self-control conflict in the first place and were hence less likely to draw on their self-control strategies to promote pro-social behavior.

Our results help corroborate prior findings in the psychological literature, which, based on paradigms different from the public goods game (Pronin *et al.*, 2008; Sheldon and Fishbach, 2011), are consistent with the idea that the decision to allocate between self and others may be understood as a problem of self-control, between the better judgment to act in the interest of others and the temptation to act in the interest of oneself. We advance the literature in at least three key respects. First, in the context of the public goods game, we propose a model that is able to capture a variety of existing stylized behavioral results for this game. According to our model,

[30] Regressions that include expectations are provided in Appendix E.

if self-control is low, and/or risk-aversion is high, the marginal benefit from cooperation—due to higher levels of average contribution levels by others—will not prove sufficient to merit taking the gamble of trying to struggle against the impulse of greed. Second, we derive four main propositions, all of which are tested and supported. Third, we show that free-riders are distinguished from others neither in their levels of self-control, nor in their risk attitudes, but rather in their tendency not to identify a self-control conflict in the first place. Fourth, we provide an explanation for the widely observed self-serving bias among conditional cooperators, meaning that they—despite their increasing contribution schedule—tend to contribute less than the average (expected) contribution of other group members. Indeed, regressions with the self-serving bias as the dependent variable and the self-control measure as an independent variable, reveal that the self-serving bias decreases in higher levels of self-control.[31]

Our results notwithstanding, a note of caution is due. The empirical strategy that we used is based on an analysis of correlations, and we should thus be careful in inferring causality. However, our theory makes clear causal predictions, with which our pattern of correlations is consistent. It is difficult to come up with parsimonious alternative accounts of our pattern of results, obtained both for conditional and unconditional cooperation, but we do acknowledge that the question of causality merits further investigation. Future studies might, for example, manipulate the independent variables that here were measured, in particular that of self-control.

While we have provided evidence for the conceptualization that temptation to act in the interest of oneself may conflict with better judgment to act in the interest of others, we do not wish to overstate the supposed generality of our findings. We believe that our conceptualization applies in situations where feelings of greed dominate those (if any) to act pro-socially. Of course, as O'Donoghue and Loewenstein (2007) as well as Andreoni *et al.* (2011) suggest, there is good reason to think that the pattern in other circumstances may reverse. Specifically, when empathetic emotion is particularly strong, individuals may feel tempted to act pro-socially—even knowing that they ought not to.

[31] Note that our rationale could, in principle, also account for a decrease of contribution levels over and above a certain level of average others' contributions, as we observe it for hump-shape contributors. It would require, beyond that level, a strictly convex temptation function.

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Figures and Tables

Figure 1 The decision problem for two discrete contribution levels c_i and c_i^+ where $c_i < c_i^+$

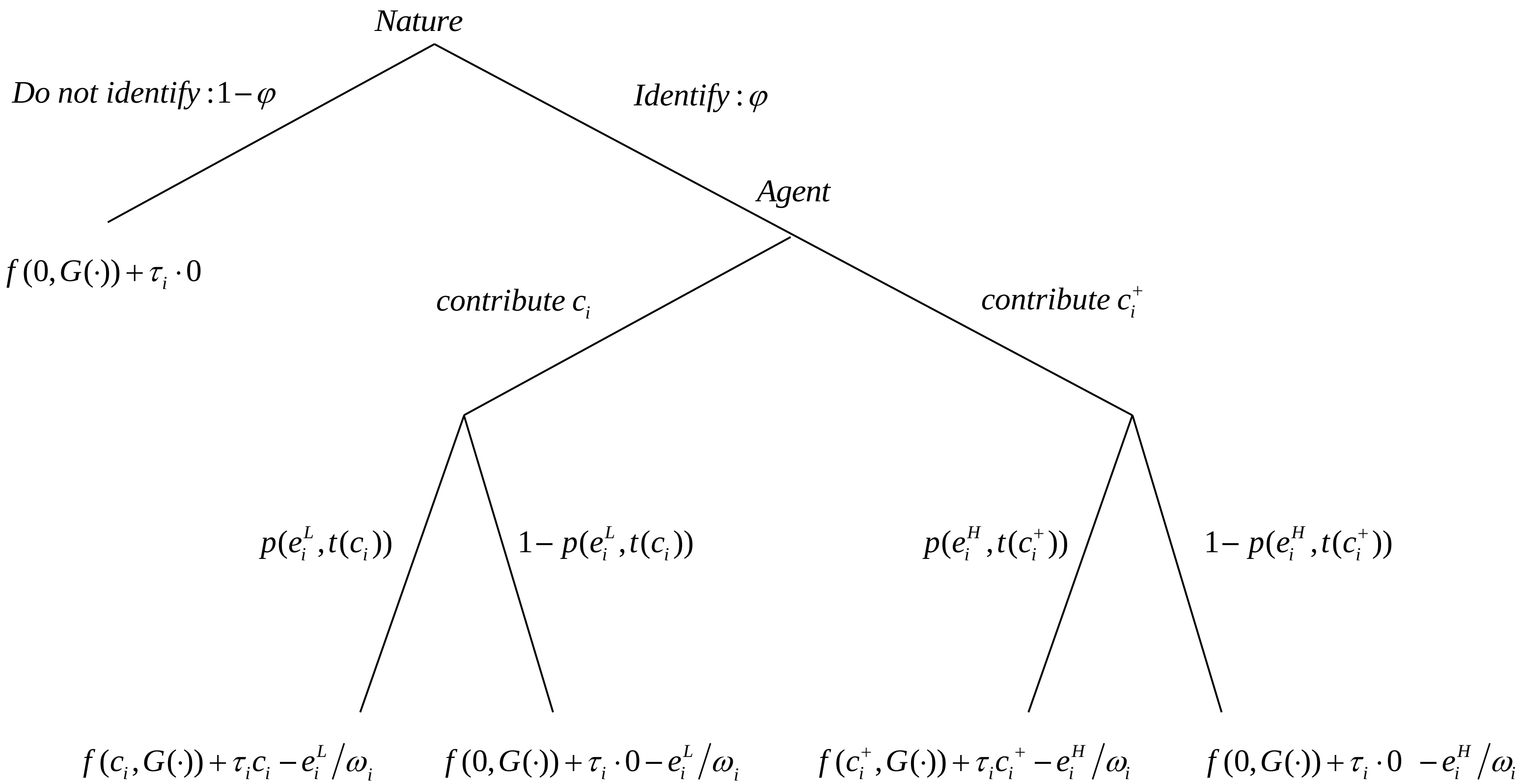
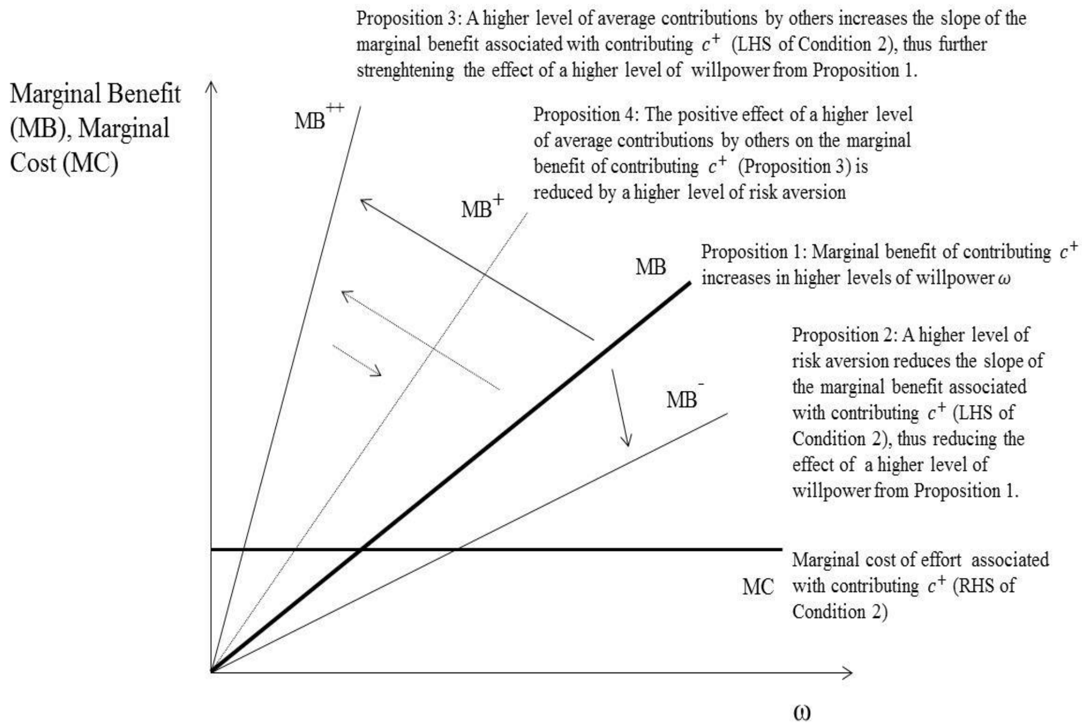
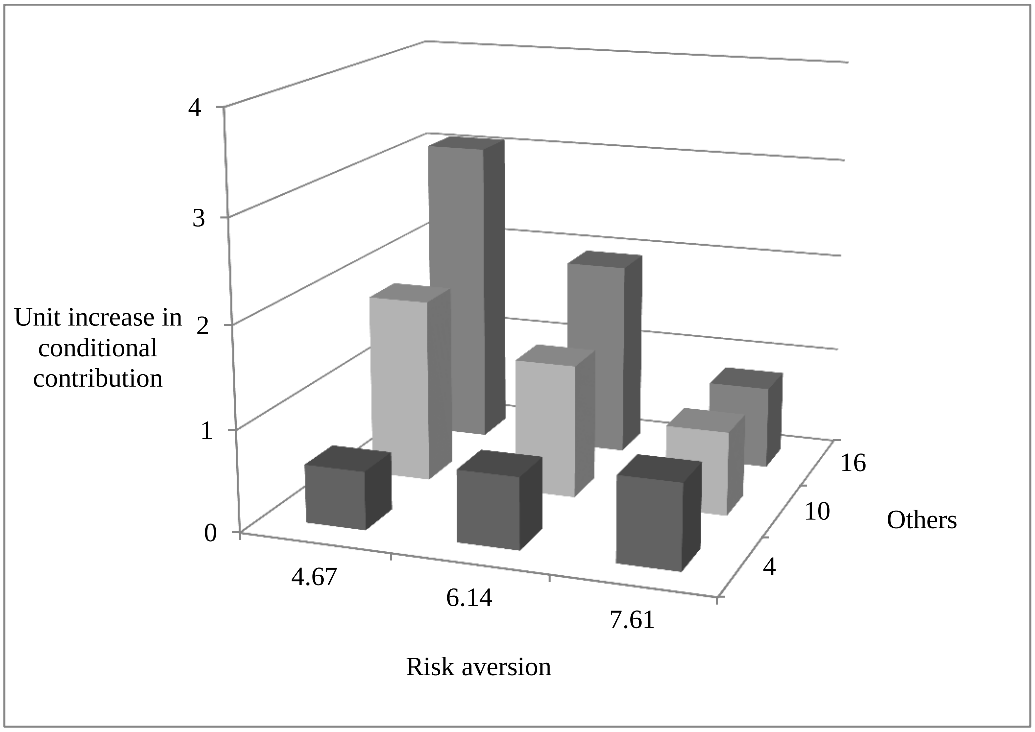


Figure 2: Visual summary of Propositions 1-4.



Note: The graph depicts the marginal benefit and cost of contributing c_i^+ rather than c_i as functions of willpower ω_i**.** As per left-hand side (LHS) of equation (3), the marginal benefit is an increasing function of willpower. The slope of this function, however, is reduced for higher levels of risk aversion (Proposition 2) and increased by the average contribution of others (Proposition 3). In addition, these two effects interact such that an increase in marginal benefit resulting from an increase in average contributions by others can be diminished by a higher level of risk aversion (Proposition 4).

Figure 3. Unit increase in conditional contribution due to a one-standard-deviation increase in RSS, evaluated at different values of Risk and Others.



Note: The marginal effect of RSS is evaluated using specification (10) in Table 2. The change in conditional contributions due to a change in RSS can be approximately written as: ΔConditional contribution = (-0.09+ 0.0186Risk + 0.0243Others - 0.0032RiskOthers)ΔRSS. The values chosen for each variable are the mean, one-standard-deviation above the mean and one-standard-deviation below the mean (N=129).

Table 1 Summary statistics

Variable	Description	Number of observations	Mean	Std. Dev	Min	Max
Unconditional contribution	Unconditional contribution to the public good	144	6.75	5.93	0	20
Conditional contribution*	Conditional contribution to the public good	3024	6.02	6.29	0	20
Conflict intensity**	A continuous variable, ranging from 0 ("not at all") to 100 ("very much), in response to the question *"To what extent did you experience conflict when deciding how much to contribute?"*	144	33.14	32.06	0	100
Conflict	A dummy variable taking zero if the participant responded 0 to the question *"To what extent did you experience conflict when deciding how much to contribute?"* taking one if the participant indicated a positive number.	144	0.75	0.43	0	1
Risk	Risk index derived from the risk experiment (switching point)	129	6.14	1.47	2	9
RSS	The Rosenbaum Self-Control Schedule score	144	16.66	22.44	-46	76
High RSS	A dummy variable equal one if the participant has a RSS score larger than the mean (17) and zero otherwise	144	0.51	0.50	0	1
Others*	A vector of integer numbers between and including 0 and 20 indicating all possible average contributions of the other three group members in the conditional contribution task	3024	10	6.06	0	20

Note: * denotes a variable constructed using the strategy method. ** denotes a response variable not used in the analysis, but transformed to a dummy. Overall 36 out of 144 respondents reported zero, indicating "Not at all" as a response.

Table 2. Conditional contributions by conflict: OLS regression results

Conflict identification:	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES
Model specification:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent variable: Conditional contribution	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
Others	0.34***	0.34***	0.34***	0.34***	0.472	0.483***	0.483***	0.483***	0.483***	0.140
	(3.96)	(3.95)	(3.95)	(3.95)	(0.69)	(10.13)	(10.13)	(10.13)	(10.12)	(0.78)
RSS		-0.09*		-0.06	0.03		0.07***		0.15***	-0.09*
		(-1.87)		(-0.41)	(0.23)		(4.95)		(2.75)	(-1.80)
Risk			0.38	0.18	0.39			-0.00	0.11	-0.34
			(0.71)	(0.17)	(0.53)			(-0.00)	(0.37)	(-1.44)
RSSxRiskx100				-0.455	-2.05				-1.35	1.86**
				(-0.21)	(-1.07)				(-1.56)	(2.28)
RSSxOthersx100					-0.92					2.43***
					(-0.59)					(3.25)
RiskxOthersx100					-2.11					4.48
					(-0.20)					(1.53)
RSSxRiskxOthersx100					0.16					-0.32**
					(0.59)					(-2.54)
Constant	1.17	2.86*	-1.11	1.72	0.40	1.31***	0.26	1.31	-0.44	2.99*
	(1.31)	(1.82)	(-0.35)	(0.24)	(0.07)	(3.32)	(0.54)	(0.75)	(-0.23)	(1.93)
Number of observations	630	630	630	630	630	2079	2079	2079	2079	2079
R^2	0.10	0.18	0.10	0.18	0.19	0.24	0.30	0.24	0.30	0.32

Note: *** denotes significance and the 1% level, ** at the 5% level and * at the 10% significance level. Robust standard errors clustered on the individual level; *t*-statistics in parenthesis.

Table 3 Frequency of contributor types and variable means by types (N =129)

Contributor type	Frequency	Unconditional contribution	RSS	Risk	Conflict	Conflict intensity
Free rider	20.16%	1.12 (4.01)	14.19 (19.03)	6.20 (1.52)	0.50 (0.51)	22.65 (27.38)
Conditional cooperator	58.14%	8.11 (5.75)	17.79 (23.16)	6.27 (1.40)	0.85 (0.36)	39.29 (33.45)
Hump-shape contributor	11.63%	6.80 (5.13)	21.73 (25.40)	5.73 (1.71)	0.87 (0.35)	33.53 (30.11)
Residual	10.08%	9.31 (5.71)	8.85 (25.04)	6.00 (1.08)	0.69 (0.48)	25.46 (32.43)

Note: Free riders contribute less unconditionally than do all other types (p-values < 0.01; Mann-Whitney-U-test). Free riders also reports less conflict than all other types (p-values < 0.01; Mann-Whitney-U-test), although free riders' RSS is not significantly lower than that of other types (p-values > 0.4; Mann-Whitney-U-tests); standard deviations in parenthesis.

Table 4. Unconditional contributions by conflict identification: OLS regression results

Conflict identification:	NO	NO	NO	YES	YES	YES
Model specification:	(11)	(12)	(13)	(14)	(15)	(16)
Dependent variable: Unconditional contribution	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
RSS	-0.11**	-0.12**	-0.19	0.08***	0.08***	0.37***
	(-2.24)	(-2.33)	(-0.97)	(3.49)	(3.52)	(4.69)
Risk		-0.677	-1.013		-0.301	0.212
		(-1.05)	(-0.76)		(-0.75)	(0.53)
RSSxRisk			0.01			-0.05***
			(0.39)			(-3.97)
Constant	6.86***	11.18**	13.29	5.96***	7.80***	4.57*
	(3.80)	(2.18)	(1.41)	(8.86)	(2.98)	(1.74)
Number of observations	30	30	30	99	99	99
R^2	0.15	0.18	0.18	0.10	0.11	0.17

Note: *** denotes significance and the 1% level, ** at the 5% level and * at the 10% significance level. Robust standard errors; t-statistics in parenthesis.

Appendix A: Proofs

Derivation of Condition 2.

If the individual has not identified conflict, by assumption the perceived value of contribution is zero, and so the individual would not consider contributing anything. We next consider what the individual would do should she identify conflict.

The individual will prefer to attempt contribute $c_i^+ > c_i$ if and only if the following two conditions hold:

$$f(c_i^+, G(\cdot)) + \tau_i c_i^+ > f(c_i, G(\cdot)) + \tau_i c_i > f(0, G(\cdot)) + \tau_i \cdot 0$$

(Condition 1), and

$$p\left(e_i^H, t(c_i^+)\right)\left[f(c_i^+, G(\cdot)) + \tau_i c_i^+\right] + \left[1 - p\left(e_i^H, t(c_i^+)\right)\right]\left[f(0, G(\cdot)) + \tau_i \cdot 0\right] - \frac{e_i^H}{\omega_i}$$

$$>$$

$$p\left(e_i^L, t(c_i)\right)\left[f(c_i, G(\cdot)) + \tau_i c_i\right] + \left[1 - p\left(e_i^L, t(c_i)\right)\right]\left[f(0, G(\cdot)) + \tau_i \cdot 0\right] - \frac{e_i^L}{\omega_i}$$

To simplify the condition, we can use the following:

Given e_i^L and $p(e_i, t(c_i^+)) < p(e_i, t(c_i))$ for some $c_i^+ > c_i$, and, $p(e_i^H, t) > p(e_i^L, t)$, $\exists\, e_i^H \geq e_i^L$ such that we have $p^H = p(e_i^H, t(c_i^+)) \geq p(e_i^L, t(c_i)) = p^L$. Simplifying, the condition above and using a normalization where $f(0, G(\cdot)) + \tau_i \cdot 0 = 0$ then yields,

$$\omega_i\left(p^H - p^L\right)\left[f\left(c_i^+, G(\cdot)\right) + \tau_i c_i^+ - \left(f\left(c_i, G(\cdot)\right) + \tau_i c_i\right)\right] \geq e_i^H - e_i^L$$

Condition 2, where the left hand side (LHS) is the expected marginal benefit of attempting to contribute c_i^+ rather than attempting to contribute c_i .

Proof Proposition 1. It is clear that the LHS of this condition increases if ω increases as the derivative $\frac{\partial}{\partial\omega_i} = \left(p^H - p^L\right)\left[f\left(c_i^+, G(\cdot)\right) + \tau_i c_i^+ - \left(f\left(c_i, G(\cdot)\right) + \tau_i c_i\right)\right] > 0$, which proves the proposition.

Proof Proposition 2. From $\frac{\partial}{\partial\omega_i}$ and the definition of the utility from the payoff $x_i^{\alpha} = f(c_i, G(\cdot))$, it follows that utility for any contribution level increases as α increases. Consequently, both $f(c_i^+, G(\cdot)) + \tau_i c_i^+$ and $f(c_i, G(\cdot)) + \tau_i c_i$ increase in α. LHS of Condition 2 is positive, but increasing risk aversion reduces the positive distance between the two utilities and approaches $\tau_i(c_i^+ - c_i)$ zero as $\alpha \to 0$, which proves the proposition.

Proof Proposition 3. From $\tau_i = \tau_i(\overline{c})$, we have that

$$\frac{\partial}{\partial\omega_i} = \left(p^H - p^L\right)\left[f\left(c_i^+, G(\cdot)\right) + \tau_i(\overline{c})c_i^+ - \left(f\left(c_i, G(\cdot)\right) + \tau_i(\overline{c})c_i\right)\right]$$

Since $\tau'(\overline{c}) \geq 0$, increasing $\overline{c}$ will increase the positive distance in square brackets, and so increasing the level of others' average contribution will enhance the effect of willpower.

Proof Proposition 4 Again using the expression

$$\frac{\partial}{\partial\omega_i} = \left(p^H - p^L\right)\left[f\left(c_i^+, G(\cdot)\right) + \tau_i(\overline{c})c_i^+ - \left(f\left(c_i, G(\cdot)\right) + \tau_i(\overline{c})c_i\right)\right]$$

we recall that letting α approach zero (increasing concavity of the utility function) reduces the positive distance in square brackets, which proves the proposition.

Appendix B: The Rosenbaum Self-Control Schedule

Note: * = item is reverse-scored.

Directions - Indicate how characteristic or descriptive each of the following statements is of you by using the code given below

+3 very characteristic of me, extremely descriptive
+2 rather characteristic of me, quite descriptive
+1 somewhat characteristic of me, slightly descriptive
-1 somewhat uncharacteristic of me, slightly undescriptive
-2 rather uncharacteristic of me, quite undescriptive
-3 very uncharacteristic of me, extremely nondescriptive

l. When I do a boring job, I think about the less boring parts of the job and the reward that I will receive once I am finished.

-3	-2	-1	1	2	3

2. When I have to do something that is anxiety arousing for me, I try to visualize how I will overcome my anxieties while doing it.

-3	-2	-1	1	2	3

3. Often by changing my way of thinking I am able to change my feelings about almost everything.

-3	-2	-1	1	2	3

4. I often find it difficult to overcome my feelings of nervousness and tension without any outside help.*

-3	-2	-1	1	2	3

5. When I am feeling depressed I try to think about pleasant events.

-3	-2	-1	1	2	3

6. I cannot avoid thinking about mistakes I have made in the past.*

-3	-2	-1	1	2	3

7. When I am faced with a difficult problem, I try to approach its solution in a systematic way.

-3	-2	-1	1	2	3

8. I usually do my duties quicker when somebody is pressuring me.*

-3	-2	-1	1	2	3

9. When I am faced with a difficult decision, I prefer to postpone making a decision even if all the facts are at my disposal.*

-3	-2	-1	1	2	3

10. When I find that I have difficulties in concentrating on my reading, I look for ways to increase my concentration.

-3	-2	-1	1	2	3

11. When I plan to work, I remove all the things that are not relevant to my work.

-3	-2	-1	1	2	3

12. When I try to get rid of a bad habit, I first try to find out all the factors that maintain this habit.

-3	-2	-1	1	2	3

13. When an unpleasant thought is bothering me, I try to think about something pleasant.

-3	-2	-1	1	2	3

14. If I would smoke two packages of cigarettes a day, I probably would need outside help to stop smoking.*

-3	-2	-1	1	2	3

15. When I am in a low mood, I try to act cheerful so my mood will change.

-3	-2	-1	1	2	3

16. If I had the pills with me, I would take a tranquilizer whenever I felt tense and nervous.*

-3	-2	-1	1	2	3

17. When I am depressed, I try to keep myself busy with things that I like.

-3	-2	-1	1	2	3

18. I tend to postpone unpleasant duties even if I could perform them immediately.*

-3	-2	-1	1	2	3

19. I need outside help to get rid of some of my bad habits.*

-3	-2	-1	1	2	3

20. When I find it difficult to settle down and do a certain job, I look for ways to help me settle down.

-3	-2	-1	1	2	3

21. Although it makes me feel bad, I cannot avoid thinking about all kinds of possible catastrophes in the future.*

-3	-2	-1	1	2	3

22. First of all I prefer to finish a job that I have to do and then start doing the things I really like.

-3	-2	-1	1	2	3

23. When I feel pain in a certain part of my body, I try not to think about it.

-3	-2	-1	1	2	3

24. My self-esteem increases once I am able to overcome a bad habit.

-3	-2	-1	1	2	3

25. In order to overcome bad feelings that accompany failure, I often tell myself that it is not so catastrophic and that I can do something about it.

-3	-2	-1	1	2	3

26. When I feel that I am too impulsive, I tell myself "stop and think before you do anything."

-3	-2	-1	1	2	3

27. Even when I am terribly angry at somebody, I consider my actions very carefully.

-3	-2	-1	1	2	3

28. Facing the need to make a decision, I usually find out all the possible alternatives instead of deciding quickly and spontaneously.

-3	-2	-1	1	2	3

29. Usually I do first the things I really like to do even if there are more urgent things to do.*

-3	-2	-1	1	2	3

30. When I realize that I cannot help but be late for an important meeting, I tell myself to keep calm.

-3	-2	-1	1	2	3

31. When I feel pain in my body, I try to divert my thoughts from it.

-3	-2	-1	1	2	3

32. I usually plan my work when faced with a number of things to do.

-3	-2	-1	1	2	3

33. When I am short of money, I decide to record all my expenses in order to plan more carefully for the future.

-3	-2	-1	1	2	3

34. If I find it difficult to concentrate on a certain job, I divide the job into smaller segments.

-3	-2	-1	1	2	3

35. Quite often I cannot overcome unpleasant thoughts that bother me.*

-3	-2	-1	1	2	3

36. Once I am hungry and unable to eat, I try to divert my thoughts away from my stomach or try to imagine that I am satisfied.

-3	-2	-1	1	2	3

Appendix C: Experimental instructions[32]

Welcome to the experiment and thank you for participating!

Please stop talking to other participants from now on.

General

This is an experiment on economic decision making. You will earn "real" money that will be paid out to you in cash at the end of the experiment. During the experiment all participants will be asked to make decisions. Your decisions and the decisions of other participants determine your earnings from the experiment according to the following rules.

The experiment will last two hours. If you have any questions or if anything is unclear, please raise your hand, and one of the experimenters will come to you and answer your questions privately.
During the experiment a part of your earnings will be calculated in **points**. At the end of the experiment all points that you earn will be converted into euro at the exchange rate of

1 point = 0.33 euro (3 points = 1 euro).

In the interest of clarity, we will only use male terms in the instructions.

Anonymity

You will learn neither during nor after the experiment, with whom you interact(ed) in the experiment. The other participants will neither during nor after the experiment learn, how much you earn(ed). We never link names and data from experiments. At the end of the experiment you will be asked to sign a receipt regarding your earnings which serves only as a proof for our sponsor. The latter does not receive any other data from the experiment.

Means of help

You will find a pen at your table which you, please, leave behind on the table when the experiment is over. While you make your decisions, a clock will run down at the top of your computer screen. This clock will give you an orientation how long you should need to make your decisions. But you can nevertheless exceed this time. The input screens will not be dismissed once time is over. However, the pure output screens (here you do not have to make a decision) will be dismissed.

Experiment

The experiment consists of three parts. You will receive instructions for a part after the previous part has ended. The parts of the experiment are completely independent; decisions in one part have no consequences for your earnings in later parts. The sum of earnings from the different parts will constitute your total earnings from the experiment.

[32] Translated from German.

Part I

The decision situation

The basic decision situation will be explained to you in the following. Afterwards you will find control questions on the screen which should raise your familiarity with the decision situation.

You will be a member of a group consisting of **4 people**. Each group member has to decide on the allocation of 20 points. You can put these 20 points into your **private account** or you can put them **fully or partially** into a **group account**. Each point you do not put into the group account will automatically remain in your private account.

Your income from the private account:

You will earn one point for each point you put into your private account. For example, if you put 20 points into your private account (and therefore do not put anything into the group account) your income will amount to exactly 20 points out of your private account. If you put 6 points into your private account, your income from this account will be 6 points. No one except you earns something from your private account.

Your income from the group account:

Each group member will profit equally from the amount you put into the group account. On the other hand, you will also get a payoff from the other group members' in-payments into the group account. The income for each group member out of the group account will be determined as follows:

Income from group account =
Sum of all group members' contributions to the group account $\times$ *0.4*

If, for example, the sum of all group members' contributions to the group account is 60 points, then you and the other members of your group each earn 60 x 0.4 = 24 points out of the group account. If the four group members contribute a total of 10 points to the group account, you and the other members of your group each earn 10 x 0.4 = 4 points out of the group account.

Total income:

Your total income is the sum of your income from your private account and that from the group account:

Income from your private account (= 20 – contribution to group account)
+ Income from group account (= 0,4 $\times$ *sum of contributions to group account)*
= Total income

Before we proceed, please try to solve the control questions on your screen. If you want to compute something, you can use the Windows calculator by clicking on the respective symbol on your screen.

Procedure of Part I

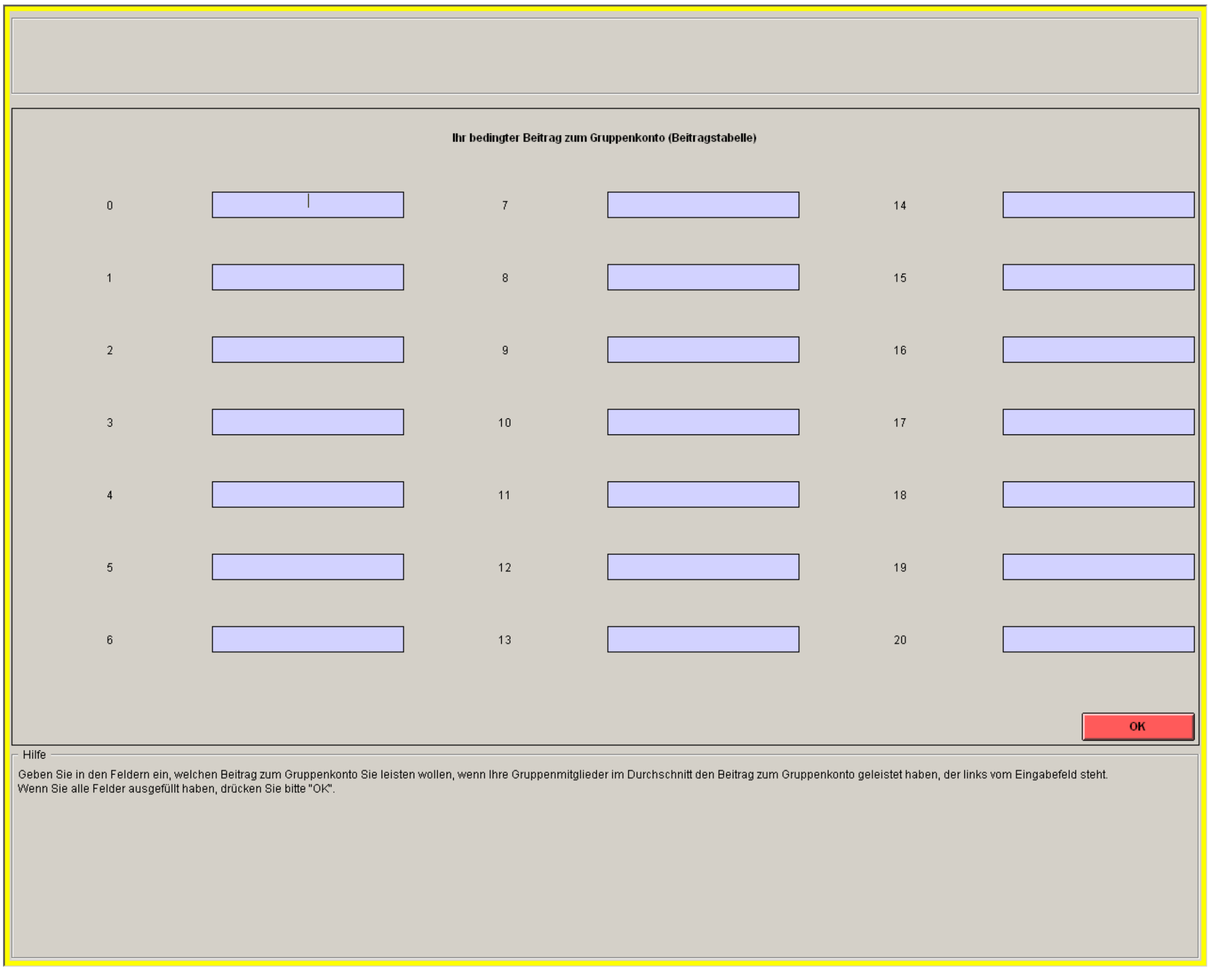
Part I includes the decision situation just described to you. The decisions in Part I will only be made **once**.

On the first screen you will be informed about your **group membership number**. This number will be of relevance later on. If you have taken note of the number, please click "next".

Then you have to make your decisions. As you know, you will have 20 points at your disposal. You can put them into your private account or you can put them into the group account. Each group member has to make **two types** of contribution decisions which we will refer to below as the **unconditional contribution** and the **contribution table**.

- In the **unconditional contribution** case you decide how many of the 20 points you want to put into the group account. Please insert your unconditional contribution in the respective box on your screen. You can insert integer numbers only. Your contribution to the private account is determined automatically by the difference between 20 and your contribution to the group account. After you have chosen your unconditional contribution, please click "next".

- On the next screen you are asked to fill in a **contribution table**. In the contribution table you indicate **how much <u>you</u> want to contribute to the group account for each possible average contribution of the <u>other</u> group members** (rounded to the next integer). Thus, you can condition your contribution on the other group members' average contribution. The contribution table looks as follows:



The numbers in each of the left columns are the possible (rounded) average contributions of the **other** group members to the group account. This means, they represent the amount each of the other group members' has put into the group account on average. You simply have to insert into the input boxes how many points you want to contribute to the group account – conditional on the indicated average contribution. **You have to make an entry**

into each input box. For example, you will have to indicate how much you contribute to the group account if the others contribute 0 points to the group account on average, how much you contribute if the others contribute 1, 2, or 3 points on average, etc. You can insert any integer numbers from 0 to 20 in each input box. Once you have made an entry in each input box, please click “OK”.

After all participants of the experiment have made an unconditional contribution and have filled in their contribution table, a random mechanism will select a group member from every group. Only **the contribution table** will be the payoff-relevant decision for the **randomly determined subject**. Only the **unconditional contribution** will be the payoff-relevant decision for the **other three group members** not selected by the random mechanism. You obviously do not know whether the random mechanism will select you when you make your unconditional contribution and when you fill in the contribution table. You will therefore have to think carefully about both types of decisions because both can become relevant for you. Two examples should make this clear.

<u>**Example 1:**</u> Assume that **the random mechanism selects you. This implies that your relevant decision will be your contribution table**. The unconditional contribution is the relevant decision for the other three group members. Assume they made unconditional contributions of 0, 2, and 5 points. The average rounded contribution of these three group members, therefore, is 2 points ((0+2+5)/3 = 2.33).
If you indicated in your contribution table that you will contribute 1 point to the group account if the others contribute 2 points on average, then the total contribution to the group account is given by 0+2+5+1=8 points. All group members, therefore, earn 0.4×8=3.2 points out of the group account plus their respective income from the private account.

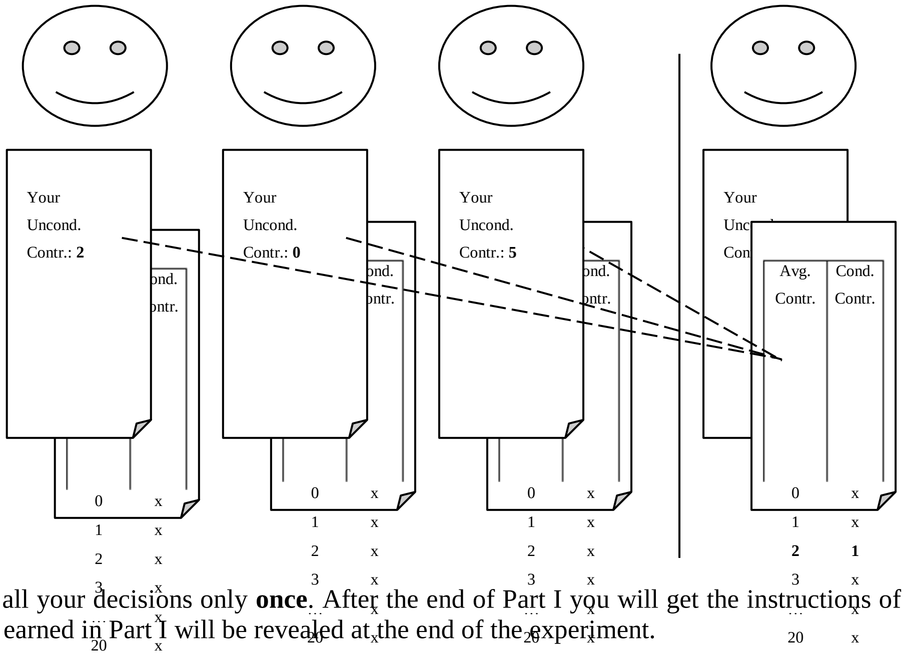
If, instead, you indicated in your contribution table that you would contribute 19 points if the others contribute two points on average, then the total contribution of the group to the group account is given by 0+2+5+19=26. All group members therefore earn 0.4×26=10.4 points out of the group account plus their respective income from the private account.

<u>**Example 2:**</u> Assume that **the random mechanism did not select you,** implying that **the unconditional contribution is taken as the payoff-relevant decision** for you and two other group members. Assume your unconditional contribution to the group account is 16 points and those of the other two group members are 18 and 20 points. The average unconditional contribution of you and the other two group members, therefore, is 18 points (= (16+18+20)/3).

If the group member whom the random mechanism selected indicates in her contribution table that she will contribute 1 point to the group account if the other three group members contribute on average 18 points, then the total contribution to the group account is given by 16+18+20+1=55 points. All group members will therefore earn 0.4×55=22 points out of the group account plus their respective income from the private account.
If, instead, the randomly selected group member indicates in her contribution table that she contributes 19 points to the group account if the others contribute on average 18 points, then the total contribution to the group account is given by 16+18+20+19=73 points. All group members will therefore earn 0.4×73=29.2 points out of the group account plus their respective income from the private account.

The random selection of the participants will be implemented as follows. A randomly selected participant will throw a 4-sided dice **after** all participants have made their unconditional contribution and have filled in their contribution table. She enters the thrown number into the computer thereby being monitored by the experimenter who confirms the correctness of the entry by password. The thrown number will then be compared with the group membership number, which was shown to you on the first screen. If the thrown number equals your group membership number, then your contribution table is payoff-relevant for you and the unconditional contribution is payoff-relevant for the other three group members. Otherwise, your unconditional contribution is the relevant decision for you.

The following figure visualizes the situation in example 1. You are the person on the right side with group membership number 3. Number 3 was thrown and therefore your conditional contribution is payoff-relevant. For the other three group members the unconditional contribution is payoff-relevant.



You will make all your decisions only **once**. After the end of Part I you will get the instructions of Part II. How much you have earned in Part I will be revealed at the end of the experiment.

Part II[33]

(handed out after completion of Part 1)

In Part II you will receive **10 decision problems**. You do not interact with another person in this part. In each of the problems you can choose between **two alternative lotteries**. Your decisions are only valid after you have made a decision for all problems and after you have clicked on the OK-button in the lower part of your screen. Take your time for your decisions because your choice determines your earnings from the second part according to the rules described below.

Here is an example for such a decision problem:

Lottery X	**Lottery Y**	**<u>Your choice</u>**
You receive 2 EUR with probability 8/10 or 1.60 EUR with probability 2/10	You receive 3.85 EUR with probability 8/10 or 0.10 EUR with probability 2/10	□ Lottery X □ Lottery Y

Your earnings will be determined in the following way: First, the computer chooses one of the 10 decision problems randomly and with equal probability. The lottery that you chose for this decision problem will then be simulated in the way that the computer draws a random number between 0 and 10.
For example: Assume that the computer randomly chooses the decision problem from the table above, and your choice was lottery X. Then, the computer simulates lottery X, and you receive either 2 EUR (with probability 8/10 = 80%) or 1.60 EUR (with probability 2/10 = 20%) as your earnings from Part II of the experiment. You will receive the high payoff if the randomly chosen number is smaller or equal to 8 (80% probability) and the low payoff if the random number is bigger than 8 (20% probability).
If, however, the computer chooses a decision problem with a 40% probability of receiving the high payoff, then each random number below or equal to 4 will result in the high payoff whereas all numbers bigger than 4 lead to the low payoff, etc.

Please note that we are talking about euro-amounts here and not about points! The euro-amount that you will earn in Part II will be added to the in euro converted points from the other parts.
You will make your decisions only **once**. How much you have earned in Part II will be revealed at the end of the experiment.

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[33] Part III of the instructions for the trust experiment used in Kocher *et al.* (2011) is not displayed here.

Appendix D: Measuring individual risk attitudes with the Holt and Laury (2002) design

Table 5. The ten paired lottery-choice decisions.

Option X	**Option Y**	**Expected payoff difference**
1/10 of €2.00, 9/10 of €1.60	1/10 of €3.85, 9/10 of €0.10	€ 1.17
2/10 of €2.00, 8/10 of €1.60	2/10 of €3.85, 8/10 of €0.10	€ 0.83
3/10 of €2.00, 7/10 of €1.60	3/10 of €3.85, 7/10 of €0.10	€ 0.50
4/10 of €2.00, 6/10 of €1.60	4/10 of €3.85, 6/10 of €0.10	€ 0.16
5/10 of €2.00, 5/10 of €1.60	5/10 of €3.85, 5/10 of €0.10	-€ 0.18
6/10 of €2.00, 4/10 of €1.60	6/10 of €3.85, 4/10 of €0.10	-€ 0.51
7/10 of €2.00, 3/10 of €1.60	7/10 of €3.85, 3/10 of €0.10	-€ 0.85
8/10 of €2.00, 2/10 of €1.60	8/10 of €3.85, 2/10 of €0.10	-€ 1.18
9/10 of €2.00, 1/10 of €1.60	9/10 of €3.85, 1/10 of €0.10	-€1.52
10/10 of €2.00, 0/10 of €1.60	10/10 of €3.85, 0/10 of €0.10	-€1.85

Note that risk neutral persons choose option X for the first four lotteries and switch to option Y afterwards. Risk averse persons will switch to option Y later whereas risk-loving individuals switch to Y before the fourth lottery.

Appendix E: Robustness checks – For referee's use only.

Table 2b. Unconditional contributions by conflict: Tobit regression results

Conflict identification:	NO	NO	NO	YES	YES	YES
Model specification	(11)	(12)	(13)	(14)	(15)	(16)
Dependent variable: Unconditional contribution	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
RSS	-0.31**	-0.33**	-0.37	0.11***	0.11***	0.49***
	(-2.20)	(-2.25)	(-0.68)	(3.37)	(3.38)	(4.01)
Risk		-1.09	-1.26		-0.19	0.50
		(-0.65)	(-0.45)		(-0.36)	(0.89)
RSSxRiskx100			0.689			-5.91***
			(0.09)			(-3.54)
Constant	4.87	11.87	12.99	4.72***	5.91*	1.549
	(1.30)	(0.95)	(0.65)	(4.82)	(1.67)	(0.40)
Number of observations	30	30	30	99	99	99
Pseudo R^2	0.09	0.05	0.05	0.02	0.02	0.03

Note: *** p<0.01, ** p<0.05, * p<0.1, robust standard errors, t-statistics in parentheses.

Table 2c. Unconditional contributions by alternative conflict definition[A]: OLS regressions results

Conflict identification:	NO	NO	NO	YES	YES	YES
Model specification	(11)	(12)	(13)	(14)	(15)	(16)
Dependent variable: Unconditional contribution	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
RSS	0.01	0.01	0.07	0.10**	0.10**	0.47***
	(0.36)	(0.33)	(0.50)	(2.67)	(2.70)	(3.37)
Risk		-0.18	-0.03		-0.37	0.48
		(-0.44)	(-0.08)		(-0.56)	(0.62)
RSSxRiskx100			-0.954			-5.48***
			(-0.47)			(-2.74)
Constant	6.20***	7.34**	6.39**	5.50***	7.74*	2.25
	(7.96)	(2.61)	(2.22)	(4.66)	(1.79)	(0.46)
Number of observations	87	87	87	42	42	42
R^2	0.01	0.01	0.01	0.10	0.11	0.20

Note: *** p<0.01, ** p<0.05, * p<0.1, robust standard errors, t-statistics in parentheses. [A] = A conflict dummy variable equal to one if conflict intensity measure is greater than 50, otherwise it is equal to zero.

Table 2d. Unconditional contributions: OLS regression results using conflict intensity

Model specification:	(27)	(28)	(29)
Dependent variable: Unconditional contribution	Coeff.	Coeff.	Coeff.
RSS	-0.01	-0.01	0.04
	(-0.36)	(-0.36)	(0.26)
RSSxConflict intensityx100	0.158**	0.161**	0.483*
	(2.22)	(2.34)	(1.77)
Conflict intensityx100	-0.99	4.47	-3.48
	(-0.44)	(0.61)	(-0.33)
Risk		8.32	4.69
		(0.17)	(0.08)
RiskxConflict intensityx100		-0.885	0.345
		(-0.86)	(0.22)
RSSxRiskx100			-0.89
			(-0.41)
RSSxRiskxConflict intensityx100			-0.05
			(-1.21)
Constant	6.30***	5.78*	6.04
	(5.99)	(1.74)	(1.45)
Number of observations	129	129	129
R^2	0.06	0.07	0.10

Note: *** p<0.01, ** p<0.05, * p<0.1, robust standard errors, t-statistics in parentheses.

Table 3b. Conditional contributions by conflict: Tobit regression results

Conflict identification:	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES
Model specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent variable: Conditional contribution	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
Others	0.70***	0.69***	0.70***	0.70***	2.30*	0.64***	0.64***	0.64***	0.64***	0.17
	(3.68)	(3.61)	(3.66)	(3.70)	(1.75)	(11.30)	(11.42)	(11.30)	(11.44)	(0.80)
RSS		-0.19		0.09	0.77*		0.09***		0.20**	-0.11
		(-1.44)		(0.22)	(1.79)		(4.49)		(2.45)	(-1.29)
Risk			0.67	1.16	3.76			-0.02	0.11	-0.63
			(0.40)	(0.39)	(1.51)			(-0.05)	(0.26)	(-1.43)
RSSxRisk				-0.05	-0.17**				-0.02	0.03**
				(-0.71)	(-2.41)				(-1.36)	(2.12)
RSSxOthers					-0.07*					0.03***
					(-1.83)					(3.22)
RiskxOthers					-0.26					0.07**
					(-1.32)					(2.12)
RSSxRiskxOthersx100					1.17*					-0.44***
					(1.93)					(-2.82)
Constant	-9.42**	-5.37	-13.41	-12.82	-28.95	-1.58**	-3.04***	-1.45	-3.75	1.31
	(-2.32)	(-1.13)	(-1.33)	(-0.63)	(-1.56)	(-2.12)	(-3.50)	(-0.57)	(-1.27)	(0.45)
Number of observations	630	630	630	630	630	2079	2079	2079	2079	2079
Pseudo R^2	0.03	0.03	0.02	0.04	0.04	0.04	0.06	0.04	0.06	0.06

Note: *** p<0.01, ** p<0.05, * p<0.1, robust standard errors clustered on individual level, t-statistics in parentheses.

Table 3c. Conditional contributions by alternative conflict definition[A]: OLS regression results.

Conflict identification:	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES
Model specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent variable: Conditional contribution	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
Others	0.44***	0.44***	0.44***	0.44***	0.17	0.47***	0.47***	0.47***	0.47***	0.04
	(8.93)	(8.92)	(8.92)	(8.92)	(0.75)	(5.93)	(5.93)	(5.93)	(5.92)	(0.15)
RSS		0.01		0.01	-0.06		0.08***		0.17*	-0.11
		(0.49)		(0.09)	(-1.08)		(3.18)		(1.70)	(-1.16)
Risk			0.19	0.20	-0.19			-0.03	0.08	-0.45
			(0.58)	(0.59)	(-0.66)			(-0.08)	(0.14)	(-1.02)
RSSxRiskx100				0.07	0.75				-1.31	2.22
				(0.05)	(0.87)				(-0.87)	(1.58)
RSSxOthersx100					0.627					2.85**
					(0.69)					(2.54)
RiskxOthersx100					3.84					5.24
					(1.02)					(1.10)
RSSxRiskxOthersx100					-0.07					-0.35*
					(-0.45)					(-1.90)
Constant	1.27***	1.10*	0.11	-0.12	2.60	1.27*	-0.14	1.49	-0.68	3.60
	(2.87)	(1.68)	(0.05)	(-0.06)	(1.48)	(1.96)	(-0.16)	(0.54)	(-0.18)	(1.10)
Number of observations	1848	1848	1848	1848	1848	861	861	861	861	861
R^2	0.18	0.18	0.18	0.19	0.19	0.22	0.29	0.22	0.30	0.32

Note: *** p<0.01, ** p<0.05, * p<0.1, robust standard errors clustered on individual level, t-statistics in parentheses. [A] = A conflict dummy variable equal to one if conflict intensity measure is greater than 50, otherwise it is equal to zero.

Table 3d. Conditional contributions: OLS regression results using conflict intensity

Model specification:	(1)	(2)	(3)	(4)	(5)
Dependent variable: Conditional contribution	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
Others	0.45***	0.45***	0.37***	0.37***	0.35***
	(10.74)	(10.74)	(6.20)	(6.20)	(4.79)
RSS		0.03	-0.01	-0.01	-0.02
		(1.62)	(-0.33)	(-0.27)	(-0.72)
Conflict intensity			-0.04**	0.02	0.02
			(-1.98)	(0.51)	(0.52)
RSSxConflict intensityx1000			1.27**	1.26**	1.20*
			(2.29)	(2.29)	(1.94)
OthersxConflict intensityx1000			2.34*	2.34*	2.22
			(1.80)	(1.80)	(1.34)
Risk				0.43	0.40
				(1.17)	(1.10)
RiskxConflict intensityx1000				-9.33	-9.50
				(-1.53)	(-1.50)
RSSxRiskxOthersx1000					0.22
					(0.53)
RSSxRiskxOthersxConflict intensityx100000					0.62
					(0.07)
Constant	1.27***	0.80	1.90**	-0.79	-0.38
	(3.49)	(1.49)	(2.09)	(-0.32)	(-0.16)
Number of observations	2709	2709	2709	2709	2709
R^2	0.19	0.20	0.23	0.24	0.24

Note: *** p<0.01, ** p<0.05, * p<0.1, robust standard errors clustered on individual level, t-statistics in parentheses.

Table 4a. Unconditional contributions by conflict: OLS regression results including expectations of others average contribution

Conflict identification:	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES
Model specification:	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)
Dependent variable: Unconditional contribution	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
Expectation	1.12***	1.06***	1.12***	1.07***	3.19***	1.07***	1.02***	0.99***	1.06***	1.07**
	(7.03)	(6.90)	(7.01)	(7.11)	(4.51)	(13.40)	(12.26)	(10.70)	(13.57)	(2.45)
RSS		-0.08**		-0.01	0.01		0.03*	0.09		0.03
		(-2.28)		(-0.06)	(0.09)		(1.90)	(1.64)		(0.26)
Risk			-0.39	-0.29	1.00*			0.03	-0.05	0.10
			(-1.25)	(-0.52)	(1.87)			(0.12)	(-0.20)	(0.20)
RSSxRiskx100				-1.39	0.526			-1.02		0.268
				(-0.83)	(0.20)			(-1.18)		(0.13)
RSSxExpectationx100					-0.789					0.659
					(-0.18)					(0.48)
RiskxExpectationx100					-31.3***					-0.895
					(-2.82)					(-0.12)
RSSxRiskxExpectationx100					-0.280					-0.148
					(-0.35)					(-0.62)
Constant	-2.38***	-0.48	-0.04	1.32	-7.63**	-0.80	-0.89	-0.94	-0.48	-1.49
	(-3.34)	(-0.43)	(-0.02)	(0.32)	(-2.11)	(-1.16)	(-1.29)	(-0.57)	(-0.30)	(-0.59)
Number of observations	30	30	30	30	30	99	99	99	99	99
R^2	0.61	0.68	0.61	0.71	0.83	0.57	0.58	0.59	0.57	0.59

Note: *** p<0.01, ** p<0.05, * p<0.1, robust standard errors, t-statistics in parentheses.

Table 4b. Unconditional contributions by conflict: Tobit regression results including expectations of others average contribution

Conflict identification:	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES
Model specification:	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)
Dependent variable: Unconditional contribution	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
Expectation	2.20***	1.93***	2.20***	1.90***	12.24***	1.28***	1.22***	1.19***	1.28***	1.46**
	(4.73)	(5.36)	(4.79)	(5.46)	(4.43)	(11.20)	(10.80)	(9.85)	(11.25)	(2.38)
RSS		-0.21**		-0.00	0.68**		0.04**	0.14*		0.12
		(-2.39)		(-0.00)	(2.23)		(2.25)	(1.74)		(0.58)
Risk			-0.021	-0.09	6.90***			0.25	0.11	0.51
			(-0.02)	(-0.06)	(3.71)			(0.64)	(0.32)	(0.62)
RSSxRiskx100				-3.54	-10.70*			-1.55		-0.65
				(-0.72)	(-1.82)			(-1.33)		(-0.21)
RSSxExpectationx100					-16.80**					0.20
					(-2.20)					(0.10)
RiskxExpectationx100					-56.60***					-3.67
					(-3.95)					(-0.37)
RSSxRiskxExpectationx100					2.03					-0.107
					(1.61)					(-0.31)
Constant	-13.68***	-7.87**	-13.54*	-6.92	-52.18***	-3.03***	-3.20***	-4.57*	-3.74	-6.54
	(-3.02)	(-2.45)	(-1.79)	(-0.60)	(-3.99)	(-2.77)	(-2.93)	(-1.71)	(-1.50)	(-1.32)
Number of observations	30	30	30	30	30	99	99	99	99	99
Pseudo R^2	0.20	0.26	0.20	0.27	0.37	0.13	0.14	0.14	0.13	0.14

Note: *** p<0.01, ** p<0.05, * p<0.1, robust standard errors, t-statistics in parentheses.