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The Influence of Empirical and Normative Expectations on Cooperation

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The influence of empirical and normative expectations on cooperation*

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Abstract

In this paper, we investigate the joint influence of empirical and normative expectations on cooperative behavior. We conduct two experimental studies (n = 243) in which we separately elicit (i) behavior in a public goods game and (ii) social norms under the form of normative and empirical expectations. In a situation where individuals can decide conditionally on others' contributions, we find a strong norm of conditional cooperation whereby people find it socially appropriate to match others contribution and believe others to comply with such rule of behavior. In contrast, when there is strategic uncertainty regarding others' behavior, empirical and normative expectations diverge substantially. While individuals believe that contributing fully to the public good is the most appropriate action, they expect others to contribute only half of their resources. This renders normative expectations unpredictive for average behavior and underlines the importance of a close alignment of empirical and normative expectations for the influence of social norms on behavior.

Keywords: Cooperation; social norms; expectations; public goods; experiment

JEL Classification Numbers: H41; D63; C92.

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1 Introduction

Virtually all human behaviors are affected by normative prescriptions, from common aspects of life such as tipping in restaurants to most profound ones like religious practices. Due to their widespread influence, social norms have long attracted the interest of a wide range of disciplines among the social sciences (Cialdini et al., 1990; Coleman, 1994; Boyd and Richerson, 1994; Ostrom, 2000; Bicchieri, 2006).

Within economics, social norms are commonly defined as rules of behavior based on widely shared views on how individuals ought to behave in a certain situation (see, e.g., Elster, 1989). While this view has guided most recent investigations in economics, other definitions exist. Most prominently, Bicchieri (2006; 2016) defines social norms as behavioral rules individuals wish to conform to on condition that (a) most people in their reference network conform to it (empirical expectation), and (b) most people in their reference network believe they ought to conform to it (normative expectation). Hence, while the two definitions share a normative aspect, the latter takes into account empirical expectations as a second crucial element. The distinction between empirical and normative expectations is thereby not only relevant from a theoretical but also from a behavioral point of view. For instance, while most people agree that everybody ought to pay taxes, not everybody adheres to that norm and recent studies show that shifting beliefs about the fraction of people who pay their taxes has a significant impact on tax compliance (Hallsworth et al., 2017; Larkin et al., 2018).

In this paper, we provide a systematic analysis of the importance and interplay of empirical and normative expectations for the influence of social norms on behavior. In contrast to the bulk of previous economics literature, which has mainly focused on the role of normative expectations for behavior in individual decision-making contexts (see below), here we consider the effect of both types of expectations in a strategic decision-making context, i.e., a situation in which payoffs depend on both own and others' actions. The situation we study is that of a social dilemma, a situation where collective and individual interest are at odds. Social dilemmas are ubiquitous in nature and exist at all levels of human society, ranging from teamwork, charitable giving, and tax compliance to the provision and maintenance of public goods such as biodiversity, natural resources, and the limiting of carbon emissions to avoid climate change. Despite the bleak picture predicted by narrow self-interest, a wealth of evidence from both lab and field studies indicates that humans are, to some extent, able to put forward the common good to avert the tragedy of the commons, even in anonymous one-shot interactions (Dawes and Thaler, 1988; Ledyard, 1995; Zelmer, 2003; Rand and Nowak,

2013). The economics literature has long indicated social norms as a possible causal mechanism for cooperative behaviors (see, e.g., Camerer and Fehr (2004), Fehr and Fischbacher (2004), and, more recently, Fehr and Schurtenberger (2018)). Yet, most of these studies only provide indirect evidence for a norm of cooperation by depicting behavioral patterns that are principally consistent with the existence of such a norm. Yet, alternative explanations may exist. For example, while the sanctioning of non-cooperators (Fehr and Gächter, 2000; Fehr and Gächter, 2002) suggests the existence of a norm of conditional cooperation that individuals try to enforce through punishment, such behavior is also consistent with individuals exhibiting spiteful preferences, i.e., the taste for decreasing other's payoff at own cost. Hence, what is needed is a clean empirical identification of the relevant norm. Here, we provide *direct* evidence for the existence of a social norm of (conditional) cooperation and its importance for behavior.

Our empirical approach is based on data from two separate experiments: a *choice experiment* in which we measure cooperation behavior, and a *norm experiment* in which we measure empirical and normative expectations of cooperation. To gather a clean measure of empirical expectations free from the confounds of strategic considerations, we elicit behavior and expectations from two different sets of participants (between-subjects design).[1] In the choice experiment, participants face a standard linear public goods game in which, in groups of four, they have to decide how much of their initial endowment to contribute to a group project and how much to keep for themselves. We consider two versions of the game that differ in whether participants face strategic uncertainty regarding others' contributions or not. To measure cooperation behavior under strategic uncertainty, in a first situation, we employ a one-shot version of the public goods game above in which contribution decisions by all players are made simultaneously. In a second situation, we remove strategic uncertainty by letting participants choose on their contributions sequentially. Following the design by Fischbacher et al. (2001), we use a variant of the strategy-method (Selten, 1967) to elicit participants' willingness to conditionally cooperate. Specifically, participants are asked (in an incentive-compatible way) to state how much they are willing to contribute conditional on each possible average contribution of the other three group members. Evidence from several previous studies that have used this design reveals that attitudes towards cooperation

[1]Eliciting empirical expectations among participants of the choice experiment can introduce several confounds. First, beliefs may be formed strategically in a self-serving way to avoid norm following (Bicchieri et al., 2020). Second, if people exhibit social preferences such as inequity aversion or reciprocity, the public goods game becomes a coordination game with multiple equilibria (see Fehr and Schmidt (1999) and Dufwenberg and Kirchsteiger (2004)), rendering beliefs crucial for equilibrium play. Hence, any measure of empirical expectations elicited from participants who have skin in the game will not unequivocally identify the effect of beliefs for norm-following. See Bicchieri (2006) for a comprehensive discussion of the difference between social preference and norm-based explanations.

are heterogeneous with conditional cooperation and free riding being the two most frequent behavioral patterns (see Chaudhuri (2011) and Thöni and Volk (2018) for overviews).

In the norm experiment, participants are in the role of spectators who do not make decisions in the actual game. Instead, they are first described the decision situation of the choice experiment. After that, they are asked for their empirical and normative expectations. To elicit empirical expectations, we elicit spectators' incentivized beliefs about the behavior of participants in the choice experiment. To elicit normative expectations, we use the well-established design by Krupka and Weber (2013), which asks spectators to rate the social appropriateness of all possible actions that were available to the participants of the choice experiment. We elicit these two types of expectations in two treatments using a between-subjects design. In the first treatment, which we call UNCERTAINTY, we elicit normative and empirical expectations for the case in which players face strategic uncertainty regarding the cooperative behavior of others. In the second treatment, which we call NOUNCERTAINTY, we instead measure these expectations in the absence of strategic uncertainty, i.e., those decisions in our choice experiment in which players can condition their behavior on that of others (strategy-method).

Our results show that in the presence of strategic uncertainty, the most appropriate action is to contribute everything to the public good, but that empirical beliefs fall short of these normative expectations as spectators (correctly) anticipate that contributions will only be around half of the initial endowment. In contrast to this, we find that in the absence of strategic uncertainty, empirical and normative expectations are much more aligned. In particular, we find that there is a strong normative expectation of conditional cooperation – matching others' contributions is always the most socially appropriate thing to do – and empirical expectations closely follow this normative prescription, although even in this situation some deviations are expected. Regression analyses reveal that in this case behavior is well described by a model in which decision makers take into account both the material consequences and the social appropriateness of their actions. When empirical and normative expectations diverge strongly (as it is the case in our simultaneous game), in contrast, such a model looses its predictive power for average behavior.

Our paper contributes to two broad strands of literature. First, we contribute to the literature on social norms highlighting the importance of empirical expectations on top of normative expectations in shaping behavior. While most studies in economics have focused only on the role of normative expectations to explain behavior (see, e.g., Krupka and Weber, 2013; Gächter et al., 2013; Kimbrough and Vostroknutov, 2016; Gächter et al., 2017; Krupka et al., 2017; Barr et al., 2018), only very recently more interest has been devoted to the

interplay of empirical and normative expectations (Bicchieri et al., 2021). Here, we extend this investigation to the strategic context of cooperation, highlighting the crucial role of strategic uncertainty regarding others' behavior for the predictive power and the compliance with social norms. In line with the argument by Bicchieri (2016) and the evidence by Bicchieri and Xiao (2009), our results suggest that when empirical and normative expectations diverge substantially, normative expectations only have limited power for predicting average behavior, indicating that preferences for norm compliance are conditional on the norm compliance of others.

Second, our results contribute to the literature on cooperation in social dilemmas. In particular, we demonstrate the existence of a strong social norm of conditional cooperation. While the presence of such a norm has been frequently argued (see, e.g., Fehr and Fischbacher, 2004; Fehr and Schurtenberger, 2018), previous studies only provided indirect evidence.[2] Here, we show that one rationale for the widespread occurrence and stability of conditional cooperation (Keser and Van Winden, 2000; Fischbacher et al., 2001; Frey and Meier, 2004; Kocher et al., 2008; Fischbacher and Gächter, 2010; Rustagi et al., 2010; Chaudhuri, 2011; Volk et al., 2012; Gächter et al., 2017; Thöni and Volk, 2018; Fallucchi et al., 2019) is the close alignment of empirical and normative expectations. At the same time, our results provide a rationale for why in simultaneous interactions in which individuals face strategic uncertainty regarding others' behavior, cooperation may be fragile. The reason is that in this case, despite vast agreement that full cooperation is the most socially appropriate thing to do, only few expect others to follow this normative prescription, which, in turn, lets them deviate from the norm as well.

The remainder of the paper is organized as follows. In Section 2, we outline a conceptual framework that incorporates norms on top of material interests into an agent's utility function. In Section 3 we describe the design of our experiments. Sections 4 and 5 describe our results. Section 6 discusses and concludes.

2 Theoretical framework

To illustrate how social norms can guide cooperation behavior, we start by outlining a simple theoretical framework which is based on the social norms approach as proposed by

[2]One exception is Kimbrough and Vostroknutov (2016) who elicit normative expectations conditional on others' contribution in a previous period of a repeated public goods game. They find that selfish actions become more appropriate if others contributed less in the past. We extend this evidence by studying both normative and empirical expectations, and by eliciting conditional cooperation in a one-shot game which eliminates concerns about strategic considerations present in repeated settings.

previous literature (Krupka and Weber, 2013; Kimbrough and Vostroknutov, 2016; Fehr and Schurtenberger, 2018). This approach assumes (i) the existence of a normative expectation defined in terms of a specific behavior (also referred to as injunctive norm), and (ii) that on top of being motivated by material self-interest, individuals have an intrinsic desire to comply with the norm. In this framework, decision-maker i's utility function can be written as:

$$u_i(\pi_i, a_i) = \pi_i(a_i, a_{-i}) + \gamma_i N(a_i) \tag{1}$$

The first term corresponds to individual i's monetary payoff, $\pi_i(a_i, a_{-i})$, resulting from selecting action a_i given the actions of the other individuals, a_{-i}. The second term of the utility function captures the preference for norm compliance. The social norm function $N(.)$ assigns to each of the possible actions available to the decision maker a degree of appropriateness or inappropriateness that reflects the (injunctive) norm in the relevant group. If for an action a_i there is a collective recognition that the action constitutes "norm-consistent" behavior, then $N(.) \geq 0$. If, instead, there is a joint recognition that an action constitutes "norm-inconsistent" behavior, then $N(.) < 0$. The parameter γ_i measures the extent to which the decision-maker cares about conforming to norms. Decision-makers who care about norm compliance ($\gamma_i > 0$) enjoy a positive utility by selecting actions that are viewed as socially appropriate, whereas they suffer a disutility from actions that are inappropriate.

Applied to the context of our public good game, this framework predicts that if there exist a norm of cooperation that prescribes contributing more than zero, then individuals face a trade-off between maximizing their own monetary payoff and adhering to the norm. In this case, individuals with a very low γ_i ($\gamma_i \approx 0$) will always choose the payoff-maximizing action of defection, while those with a sufficiently large γ_i will cooperate and obey to the norm. Furthermore, depending on the exact functional form of $N(.)$, for intermediate levels of γ_i individuals may not obey to the norm perfectly but instead choose a contribution between zero and what is considered socially appropriate.

While this framework assumes that behavior depends only on normative expectations, as argued in the introduction, empirical expectations may matter for behavior, too. In particular, according to the framework of Bicchieri (2006; 2016), preferences for norm compliance are conditional, that is, people are assumed to comply with norms only if they believe enough other people comply with the norm as well.[3] We will come back to this issue in Section 5.3,

[3]One possibility of incorporating such mechanism into the model above is by allowing the preference for norm compliance, γ_i, to depend on empirical expectations about the degree of norm compliance in the population. Another possibility of how empirical expectations might affect behavior is by assuming that they have a direct effect on what is considered socially appropriate, i.e., by letting empirical expectations

where we examine the importance of empirical expectations for norm-following behavior in the context of cooperation.

3 The Experiment

Our experimental design consists of two separate experiments: a *choice experiment* and a *norm elicitation experiment*. The underlying decision situation in both experiments is a standard linear public goods game. In this game, players are matched into groups of $n = 4$, and each group member has to decide how many (if any) of their initial endowment of 20 tokens to contribute to a group project. Tokens contributed are doubled and shared equally among all four group members, irrespective of their individual contribution decisions. Hence, while each token contributed to the public good is worth 0.5 monetary units (MU) for each group member, each token not contributed is worth 1 MU to the individual, thus creating the classical free-rider problem. In the following, we describe each of the two experiments in more detail.

3.1 Choice experiment

Our choice experiment consists of two main parts. At the beginning of the experiment, participants were first introduced to the basic decision situation of the public goods game as described above. They then had to successfully complete a comprehension test consisting of several questions about the comparative statics of the game.[4] After that, the instructions for the first part were distributed. The task in this part comprises the conditional cooperation elicitation design by Fischbacher et al. (2001). Using a variant of the strategy method (Selten, 1967), this design elicits an individual's willingness to cooperate as a function of other group members' cooperation. In particular, participants are asked to make two types of decisions: an *unconditional* and a *conditional* contribution decision. In the unconditional decision, participants are simply asked to state how much they want to contribute to the public good. In the conditional decision, participants are asked to fill in a table in which they have to indicate their contribution decision for each possible (rounded) average contribution of the other three group members. The fact that participants can condition their decision on the contribution behavior of others, thus, creates a situation with no strategic uncertainty.

To guarantee incentive compatibility, in each group a random mechanism selects three

enter $N(.)$. See Tremewan and Vostroknutov (2021) for a more detailed account of the possible interactions between empirical and normative expectations.

[4]See Appendix C.1 for an English version of the instructions and a copy of the control questions.

members for whom the unconditional decision is payoff-relevant and one member for whom the conditional decision is payoff-relevant. For this participant, the conditional decision is calculated according to the (rounded) average unconditional decision of the other three group members. The conditional choices elicited through this design are a proxy for cooperation preferences in the sense that they measure people's willingness to pay for conditional cooperation. Previous studies have shown that on average people are conditionally cooperative, but that there is pronounced heterogeneity in cooperation attitudes across individuals (Fischbacher et al., 2001; Chaudhuri, 2011; Gächter et al., 2017; Thöni and Volk, 2018).

After finishing the first part, participants received instructions for the second part of the experiment. In this second part, they played another one-shot public goods game. Contrary to the first part, however, now all group members had to simultaneously decide on their contributions, i.e., they faced strategic uncertainty about the other players' behavior. In addition, they were also asked for their incentivized beliefs about the average contribution of the other three group members.[5] To avoid spillover effects between parts, individuals were randomly re-matched into groups using a perfect-stranger matching protocol, and information about behavior in the first part was only given at the very end of the experiment.[6]

3.2 Norm experiment

In our norm experiment, we elicit norms for cooperation for both decision situations of our choice experiment. We employ two treatments using a between-subjects design. In the first treatment, which we call Uncertainty, we elicit norms for (unconditional) cooperation, that is, in a situation in which agents do not know how much others are contributing. In the second treatment, which we call NoUncertainty, we elicit norms for (conditional) cooperation corresponding to the strategy-method in the first part of our choice experiment.

At the beginning of the norm experiment, participants first received instructions explaining the norm elicitation mechanism and the general structure of the public goods game. To check for their understanding of the decision situation, participants had to correctly answer several control questions regarding the incentives of the experiment and the public goods game. After that, depending on the treatment they were assigned to, participants were either introduced to the sequential game (strategy-method) as in the first part of the choice experiment, or to the simultaneous game as in the second part of the choice experiment. Subsequently, participants received instructions for the normative expectations task (part

[5]Beliefs were incentivized using the most likely interval elicitation rule (MLI) method as proposed by Schlag and van der Weele (2015).

[6]After the second part, there was one additional task in which participants faced a price list to elicit their time preferences. This data was used for another paper (see Kölle and Lauer (2019) for further details).

1), followed by the empirical expectations task (part 2). In the following, we explain both of these parts in more detail.

Elicitation of normative expectations. To elicit normative expectations (injunctive norms), we use the well-established design by Krupka and Weber (2013). In this task, participants are asked to evaluate the social appropriateness of actions on a six-point scale ranging from 1: "Very socially inappropriate" to 6: "Very socially appropriate". In the UNCERTAINTY treatment, participants were simply asked to evaluate how socially appropriate they think it is to contribute $c \in [0, 1, 2, \cdots, 20]$ when not knowing how much others contribute. In the NOUNCERTAINTY treatment, in contrast, we asked participants to evaluate how socially appropriate they think it is to contribute $c \in [0, 1, 2, \cdots, 20]$ tokens conditional on others' contributing on average 0, 5, 10, 15, or 20 tokens, respectively. We restricted the evaluation of actions to these five cases, because given the large number of possible combinations of own and others' contributions in the strategy method ($21^2 = 441$) asking for all these evaluations seems not feasible.

The evaluation of actions was incentivized. Participants were told that, at the end of the experiment, one of the possible scenarios they had evaluated would be selected at random, and that their response in this situation would be compared to those of all other participants. If a participant's appropriateness rating was the same as the modal response, then that participant would earn € 10; otherwise they would earn nothing (see Appendix C.2 for the experimental instructions). As argued by Krupka and Weber (2013), this gives participants an incentive to reveal their perception of what is commonly regarded as appropriate or inappropriate behavior, rather than their own personal judgment. This is important because social norms are collectively recognized rules of behavior, rather than personal opinions about behaviors (e.g., Elster, 1989; Ostrom, 2000).[7]

Elicitation of empirical expectations. To elicit empirical expectations, we asked participants for their incentivized beliefs about the participants' actual behavior in the choice experiment. In the UNCERTAINTY treatment, we asked them to guess how much participants contributed in the situation in which all contribution decisions were made simultaneously. In the NOUNCERTAINTY treatment, we instead asked them to guess how much participants contributed on average conditional on others' average contributions of 0, 5, 10, 15, or 20 tokens, respectively. To incentivize beliefs, we used the binarized scoring rule by Hossain and Okui (2013). Participants were given the chance of winning a prize of € 2, and the probability of winning this prize was the higher, the closer their estimate to the actual contribution

[7]See Bašić and Verrina (2020) for a recent study on the differences between social and personal norms.

behavior of participants in the choice experiment.[8] At the end of the experiment, one situation was picked at random, and the estimate in this situation determined whether a participant won the prize or not.

3.3 Procedures

Participants for both our experiments were recruited from the student subject pool of the University of Cologne using the online recruiting software ORSEE (Greiner, 2015). For the choice experiment we recruited $n = 64$ participants, and for the norm elicitation experiment we recruited a total of $n = 179$ participants (UNCERTAINTY: $n = 86$, NOUNCERTAINTY: $n = 93$). The choice experiment was computerized using z-Tree (Fischbacher, 2007) and the sessions were held at the Cologne Laboratory for Economic Research (CLER). The norm elicitation experiment was conducted online using the software Qualtrics. On average, participants in the choice experiment earned € 17.89 for sessions that lasted about one hour, while participants in the norm elicitation experiment earned on average € 8.32 for sessions that lasted around 25 minutes.

4 Results Choice Experiment

We start with the discussion of the results from the second part of our choice experiment, in which participants had to decide how much to contribute to the public good not knowing how much the others contributed. The results are summarized in the left panel of Figure 1. In line with the evidence from many previous studies (see Ledyard, 1995; Zelmer, 2003, for overviews), we observe pronounced heterogeneity in contributions. While 22% of the participants behave completely selfish and contribute nothing, 13% contribute half of their endowment and another 25% contribute their entire amount. Mean contributions amount to 9.59 (SD: 7.62), with a median of 10.

Next, we turn to the conditional contributions as elicited by the strategy-method in the first part of our choice experiment. The results are summarized in the right panel of Figure 1. The black line depicts the average conditional contribution schedule, grey-shaded rectangles display heatmaps of the relative frequency of conditional contributions: darker-shaded rectangles correspond to more frequent choices, while lighter-shaded rectangles correspond to choices that occur less frequently. The figure reveals that (on average) participants are

[8] The exact formula for determining the winning probability was as follows: Probability for € 2 (in %) = $100 - 5 \times$ (estimate - actual mean contributions)^2. The incentives were calibrated such that the expected hourly wage was similar across the empirical and normative expectation elicitation task.

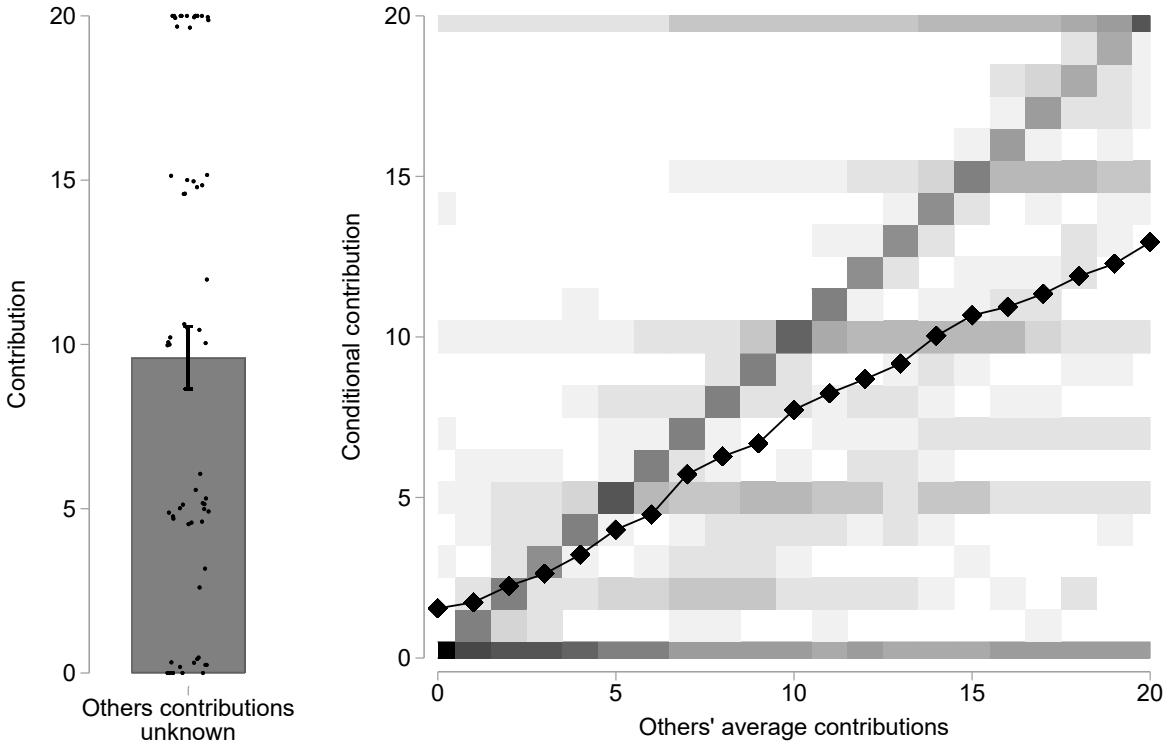

Figure 1: *Left panel*: Average contributions in the one-shot game in part 2 (± 1 s.e.m., jittered dots correspond to individual contributions). *Right panel*: Conditional contributions in the strategy method.

conditionally cooperative as indicated by the upward-sloping conditional contribution schedule. At the same time, we find that the relationship between own and others' contributions is less than one-to-one, indicating that on average participants match others' contributions only imperfectly. Both of these findings are well in line with what has been found in earlier studies (e.g., Fischbacher et al., 2001; Fischbacher and Gächter, 2010; Chaudhuri, 2011; Fischbacher et al., 2012; Gächter et al., 2017; Thöni and Volk, 2018).

The grey-shaded areas of the heatmap reveal the heterogeneity behind these results. As can be seen, there is a concentration of contributions at zero as well as along the 45° line. To shed some further light on this heterogeneity, we can use the individual contribution schedules to classify participants into distinct cooperation types. We follow the approach by Thöni and Volk (2018), which is a refinement of the method proposed by Fischbacher et al. (2001), and classify a participant as (i) *'conditional cooperator'* if their contribution schedule exhibits a (weakly) monotonically increasing pattern, or if the Pearson correlation coefficient between her schedule and the others' average contribution is greater or equal to

1/2; (ii) *'free rider'* if they never contribute anything irrespective of how much the others contribute; (iii) *'unconditional cooperator'* if they contribute a constant amount irrespective of the others' contributions; (iv) *'triangle (hump-shaped) contributor'* if their contribution pattern is strongly increasing up to a certain point but strongly decreases afterwards; or (v) *'other'* if neither (i) - (iv) applies. The results of this classification reveal that the large majority (72%) of participants are classified as conditional cooperator. A further 19% of participants follow the payoff-dominant strategy of free-riding. The remaining 9% are classified as either unconditional cooperators (3%), triangle contributors (5%), or others (1%). These results are again very much in line with those by previous literature (Fischbacher et al., 2001; Fischbacher and Gächter, 2010; Chaudhuri, 2011; Fischbacher et al., 2012; Gächter et al., 2017; Thöni and Volk, 2018).

5 Results Norm Experiment

We now turn to the discussion of the results from our norm experiment. We start with the results from the normative elicitation task, followed by the results from the empirical expectation task. After that, we provide an analysis on the predictive power of the elicited norms for behavior in our choice experiment.

5.1 Normative expectations of cooperation

We start with the results for the situation in which individuals do not know how much others contribute, i.e., the situation in which players face strategic uncertainty regarding others' behavior. The main results are summarized in Figure 2. The left panel plots the mean appropriateness ratings assigned to each possible contribution decision. The right panel shows the distribution of appropriateness ratings for each possible action. Following the approach of Krupka and Weber (2013), mean appropriateness ratings are calculated by transforming participants' responses into evenly-spaced numerical scores using the following scale: very socially inappropriate = -1; inappropriate = -0.6; somewhat socially inappropriate = -0.2; somewhat socially appropriate = 0.2; socially appropriate = 0.6; very socially appropriate = 1.

As shown by the left panel, mean social appropriateness ratings are (with one exception) monotonically increasing in the level of contributions; they obtain a minimum of -0.79 at a contribution level of zero, and reach a maximum of 0.69 when contributing the entire endowment. Contributions of ten (equal to 50% of the endowment) seem to be of particular

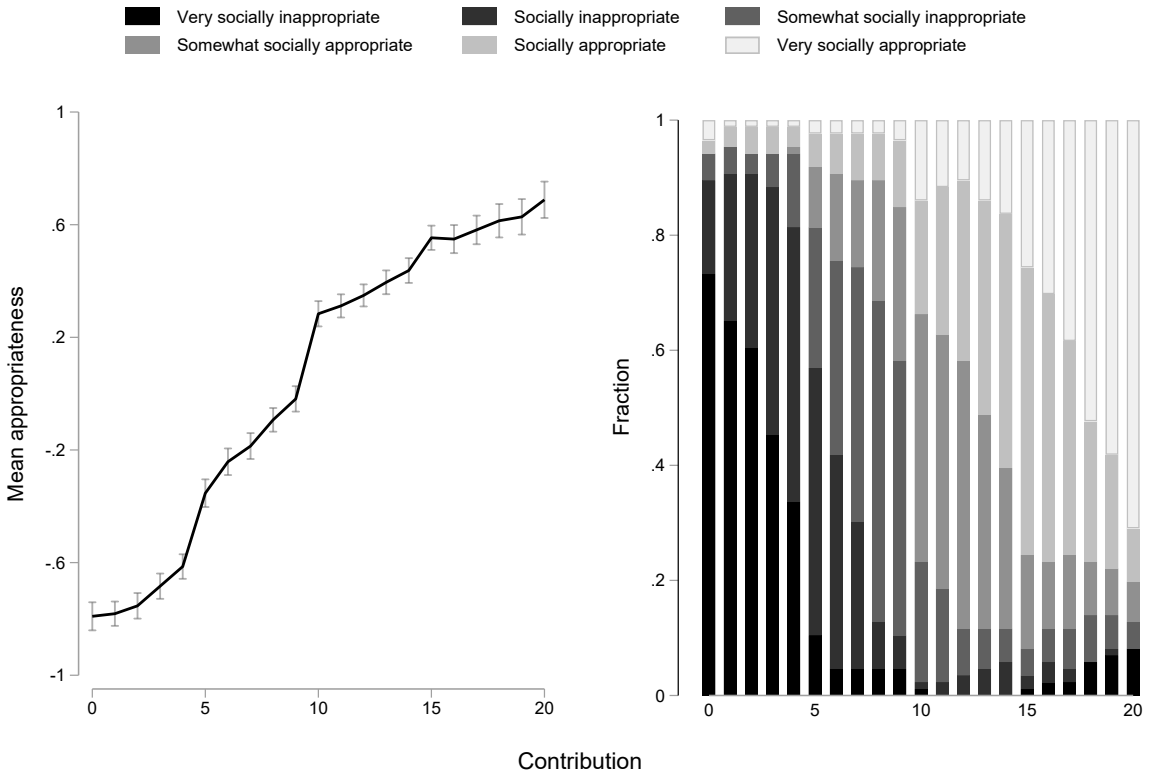

Figure 2: *Left panel*: Mean social appropriateness (± 1 s.e.m.). *Right panel*: Distribution of social appropriateness of contributions when not knowing how much others contribute.

importance for people's evaluations. While contributions lower than ten are considered to be socially inappropriate – the average social appropriateness rating is negative – contribution levels equal to or above ten are considered socially appropriate, as indicated by a positive average social appropriateness rating (see also Table A1 in Appendix A). Furthermore, while for contributions lower than ten the appropriateness schedule is rather steep (the difference between contributions of zero and ten amounts to 1.07), for contributions larger than ten it is considerably flatter (the difference between contributions of ten and twenty amounts to 0.41). Regression analysis confirms that the difference in slopes below and above ten is statistically significant (compare Table A2 in Appendix A).

The right panel of Figure 2 highlights the origin of these aggregate results. While any contribution lower than ten is perceived as socially inappropriate by most participants, any contribution larger or equal to ten is perceived as socially appropriate by a large majority of participants: the fraction of people considering an action as socially appropriate (combing all three levels of socially appropriateness) increases from 42% when contributing nine tokens to 77% when contributing 10 tokens. After that, this fraction only slightly increases further up

to 87% when contributing the entire amount of 20 tokens (compare Table A1 in Appendix A).

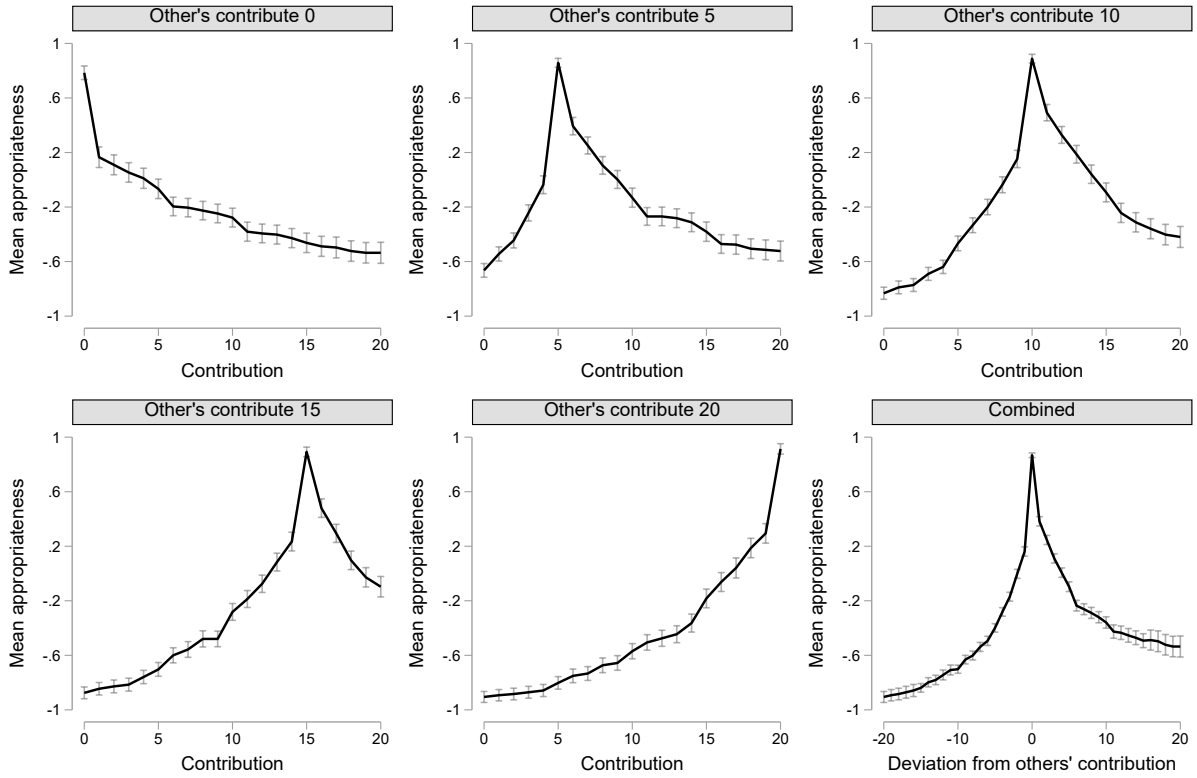

Figure 3: Social appropriateness of conditional contributions (± 1 s.e.m.)

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How does the evaluation of social appropriateness change if decision-makers no longer face strategic uncertainty with regard to others' contribution decisions? This is illustrated in Figure 3, plotting the mean appropriateness ratings assigned to each possible contribution decision, separately for all five levels of others' average contributions (see Figure A1 in Appendix A for the full distribution of appropriateness ratings for each scenario). The figure reveals that there is a very strong norm of conditional cooperation as indicated by the pronounced spike in mean appropriateness ratings when perfectly matching others' contribution. This pattern is very consistent across all scenarios, even when others contribute nothing (see also Table A1 in Appendix A). The results further show that the more a contribution deviates from others' contributions, the less socially appropriate this action is considered to be. This effect is particularly pronounced for negative deviations, but it is also present for positive deviations, although to a lesser extent. This is best seen in the bottom-right panel, which shows all data combined as a function of the deviation from others' contributions. When contributing less than others, we find that while a deviation of one token is still

considered somewhat socially appropriate (the mean appropriate rating amounts to 0.16), a deviation of two is sufficient for a contribution to be considered socially inappropriate (mean appropriate rating: -0.01). For positive deviations, we observe that it takes a deviation of at least five tokens for the social appropriateness rating to become negative. Regression analysis reveals that the difference in slopes between positive and negative deviations is statistically significant (see Table A3 in Appendix A).

The result that also positive deviations from others are considered less socially appropriate is interesting, as it reveals that behaving too altruistically, e.g., by contributing the full amount irrespective of others' contributions behavior, is not seen as something one ought to do. Such reasoning might be due to people thinking that being exploited by others is something that should be avoided. Alternatively, people might believe that contributing more than others is reprehensible because it makes others appear in a bad light. As already discussed by some previous studies (see, e.g., Monin, 2007), behaving too good or too moral might evoke suspicion or resentment, which, in turn, might lead to antisocial punishment (Herrmann et al., 2008). Our result that too high contributions are considered as socially inappropriate adds another rationale for such behavior.

5.2 Empirical expectations of cooperation

We now turn to the results from our empirical expectation task, which are summarized in Figure 4. The figure shows the distribution of stated beliefs about the average behavior of participants in our choice experiment. The upper-left panel shows these expectations for the simultaneous game, i.e., the situation in which decision makers face strategic uncertainty regarding others' behavior. The remaining panels show the same data for strategy method, i.e., the situation without strategic uncertainty.

For the case of strategic uncertainty, we find that empirical expectations drastically deviate from the normative expectations. Most spectators (about 40%) expect the decision-makers of our choice experiment to contribute on average only half of their endowment. Of the remaining spectators, 30% believe average contributions to be below ten, while a further 30% expect them to exceed ten. Only a mere 5%, however, expects average contributions of twenty, the amount that is prescribed by the injunctive norm. On average, empirical expectations amount to 10.31 (sd 3.72), which is only half of the amount that is deemed to be the most socially appropriate contribution.

For the cases without strategic uncertainty, in contrast, we find empirical expectations to be more in line with the normative expectations. The modal expectation (62% of all cases) is that players will match others' contributions perfectly, in line with what is considered to

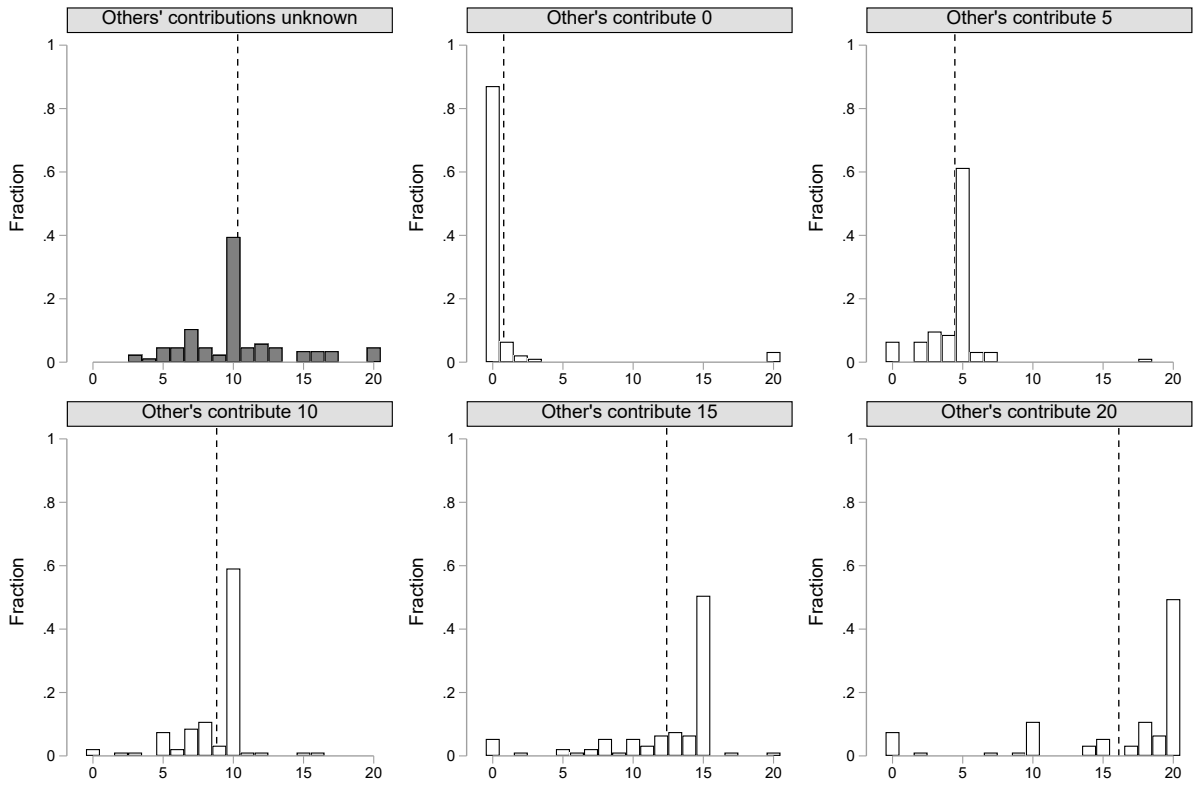

Figure 4: Distribution of empirical expectations. Dashed lines indicate mean expectations.

be the most socially appropriate action. While this pattern is particularly pronounced for low contributions of others, even when others contribute 15 and 20 tokens still half of our spectators believe that these contributions will be matched perfectly by the average decision maker. The majority of the remaining spectators estimate conditional contributions to be below others' contributions. Aggregated over all five cases, we find that 33% of all estimates are below others' contributions, while only 5% are above. At the same time, only very few spectators expect decision makers to follow the dominant strategy of free-riding (except for the case in which others are known to free-ride, too). As a result, as indicated by the vertical dashed lines depicting mean empirical expectations, spectators believe the average decision maker to follow others' contributions with a small self-serving bias.

5.3 Predicting choices using norms

What do the results on empirical and normative expectations imply for the behavior observed in our choice experiment? To illustrate this, Figure 5 combines all the elements from our two experiments into one graph: Black squares correspond to average behavior in

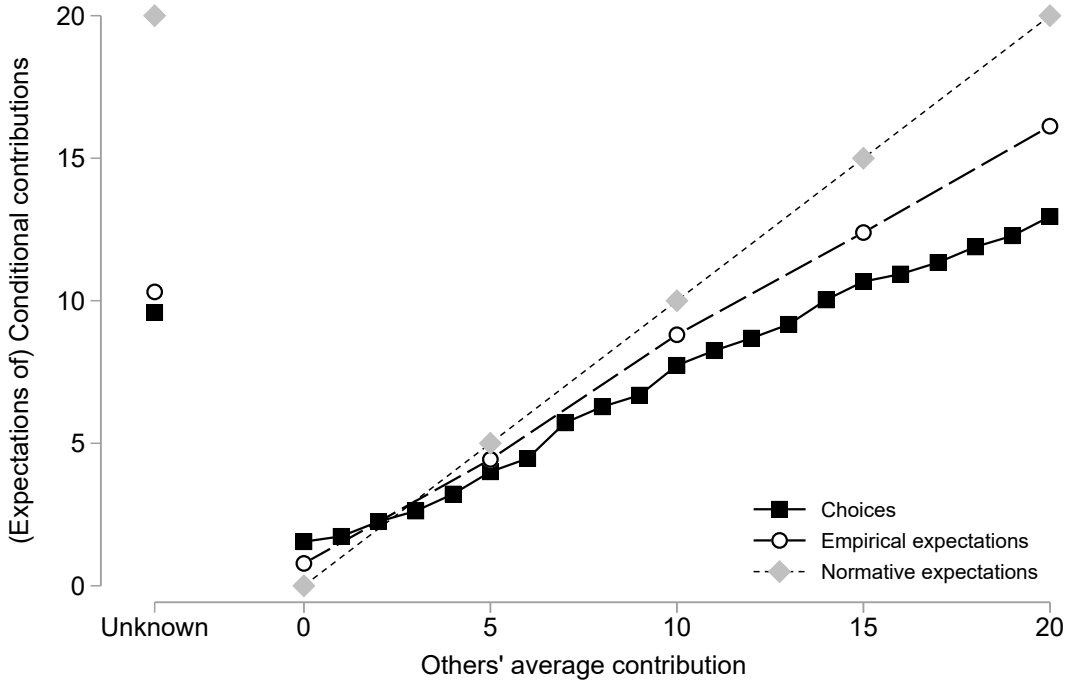

Figure 5: Interplay of empirical expectations, normative expectations, and behavior.

our choice experiment, white circles depict mean empirical expectations, and gray diamonds display the action considered most socially appropriate.

The figure reveals several important insights. First, it shows that when there is strategic uncertainty, there is a pronounced difference between people's opinion on how people ought to behave and how they actually will behave. Specifically, while the action that is considered most socially appropriate is to contribute the full endowment, spectators believe that decision-makers will not follow this behavioral prescription, but instead only contribute about half of their endowment. This expectation turns out to be very close to the average behavior we observe in our choice experiment. In contrast to this, we find that when there is no strategic uncertainty, both empirical and normative expectations are well aligned with actual behavior. Yet, even in this case we observe some negative deviation of behavior from what is considered to be most socially appropriate, although this effect is much less pronounced compared to the case with strategic uncertainty. Furthermore, while spectators correctly anticipate that not everyone will adhere to what is prescribed by the normative expectations, they underestimate the degree of non-compliance.[9] Hence, in contrast to the

[9]Note that such overoptimistic expectations may constitute another reason - in addition to the effects of imperfect conditional cooperation (Fischbacher and Gächter, 2010) - for why in finitely repeated games cooperation typically declines over time.

case with strategic uncertainty, spectators seem to be too optimistic about others cooperativeness.

To directly test for the power of the elicited norms in explaining the behavioral patterns in our choice experiment, we rely on the theoretical framework from Section 2. The framework assumes that on top of being motivated by material self-interest, individuals have an intrinsic desire to comply with the (injunctive) norm. Following the econometric approach by Krupka and Weber (2013) and related papers, we use conditional logit regressions (McFadden, 1974) to estimate the relative weights decision-makers place on the material payoff and the norm component of their utility function. We assume that individuals choose according to a logistic choice rule, where the likelihood of choosing any action, a, depends on the relative utility of that action compared to all other actions, which can be written as:

$$Pr(a = a_x) = \frac{exp(U(a_x))}{\sum_j exp(U(a_j))} \tag{2}$$

To estimate this model, as a dependent variable we use the chosen actions, and as independent variables we use the potential determinants of these actions. In our first specification we assume that utility only depends on one's own monetary payoff, i.e., we impose the restriction that $\gamma_i = 0$ in equation (1). To calculate the payoffs implied by each action, for the case without strategic uncertainty we use the average contributions of others as given in the strategy-method. For the simultaneous game, we instead calculate the expected payoff using a participant's first-order belief about the average contribution of their group members. We can then write:

$$u_i(\pi, a_i) = \beta_1 \pi_i(a_i, a_{-i}) \qquad (\textit{Selfish model})$$

To investigate whether concerns for norm compliance guide behavior, we remove the restriction on γ_i, which yields:

$$u_i(\pi, a_i) = \beta_1 \pi_i(a_i, a_{-i}) + \gamma_i N(a_i) \qquad (\textit{Norms model})$$

where $N(a_i)$ is an action's average social appropriateness rating as elicited by our norms experiment. As highlighted by previous papers using the same approach (Krupka and Weber, 2013; Gächter et al., 2013; Krupka et al., 2017; Barr et al., 2018), the coefficient for the appropriateness ratings provides an estimate of how much weight participants put on the norm-component of the utility function.

The results from these estimations are reported in Table 1. For the simultaneous game,

	Uncertainty		NoUncertainty	
	(1)	(2)	(3)	(4)
Monetary payoff	0.022	0.013	0.149***	0.379***
	(0.052)	(0.253)	(0.038)	(0.071)
Social appropriateness		-0.053		2.539***
		(1.334)		(0.264)
Observations	1344	1344	6720	6720
Log likelihood	-194.705	-194.704	-943.736	-721.543
Bayesian IC	396.614	403.815	1896.286	1460.712

Notes: Conditional (fixed effects) logit regressions. The dependent variable is the chosen action in the simultaneous one-shot (Models 1 and 2) or the strategy-method experiment (Models 3 and 4). The dependent variable takes value 1 for the contribution that was chosen, and 0 for the other possible contributions that were not chosen. The dataset comprises choices from all $n = 64$ participants of our choice experiment. Robust standard errors, clustered at the individual level, are in parentheses. Significance levels * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 1: Conditional logit estimation of choice determinants for the simultaneous and the strategy-method game.

the coefficient on monetary payoffs, though positive, is small and not different from zero in the selfish model in column (1). Because free riding is dominant strategy, this model does a poor job of explaining the substantial number of nonzero contributions (compare Figure 1). As can be seen from the results in column (2), augmenting the selfish model with the norm ratings doesn't increase the model's predictive fit as measured by both the likelihood ratio and the Bayesian Information Criterion (BIC), which penalizes models for the number of parameters (likelihood-ratio test, $p = 0.961$). Furthermore, the coefficient of social appropriateness is close to and not significantly different from zero ($p = 0.968$). The reason is that there is widespread heterogeneity in contributions (compare Figure 1) and average behavior is well explained neither by self-interest nor by norm-following. Importantly, this does not mean that individuals do not care about these motives, but that when there is a trade-off between these two pulling behavior in opposite directions (as it is the case in our setup), none of these factors is good at predicting average behavior.

For the strategy-method experiment, in contrast, we find the coefficient for the own monetary payoff to be positive and significant, indicating that participants are more likely to choose actions with higher payoffs. At the same time, we find the coefficient of the social appropriateness rating to be positive and highly significant (column 4), indicating that actions that are deemed more appropriate are chosen more often. Consequently, in this case the norm-augmented model does a much better job in explaining behavior than

the selfish model, as also shown by the significantly lower Bayesian Information Criterion (likelihood-ratio test, $p < 0.001$).

Taken together, our results reveal that normative expectations are a good predictor of average behavior if they are well-aligned with empirical expectations (as in our strategy-method experiment), but not when there is a pronounced conflict between these two (as in our simultaneous game). This finding is reminiscent of that by Bicchieri and Xiao (2009), who show a similar effect in the setting of a dictator game. These results suggest that people exhibit conditional preferences for norm compliance, i.e., they are willing to comply with (injunctive) norms only if enough others (are believed to) do so, too.[10]

6 Conclusion

In this paper, we have investigated the importance and the predictive power of social norms of cooperation. According to Bicchieri (2006; 2016), social norms are behavioral rules individuals wish to conform to on condition that (a) most people conform to it (empirical expectation), and (b) most people believe they ought to conform to it (normative expectation). In light of this, we have conducted two studies in the context of a social dilemma. In the first study, we have measured behavior (choice experiment) while in the second we have elicited empirical and normative expectations (norm elicitation experiment). Our results show that in settings without strategic uncertainty people follow a norm of conditional cooperation whereby (i) individuals are willing to increase their contributions as others' contributions increase, (ii) there is a common belief that others are going to do the same and (iii) there is shared agreement that this is the appropriate thing to do. When individuals face strategic uncertainty regarding others' behavior, in contrast, injunctive norms have a much weaker influence on behavior. In such a situation, there is a shared agreement that full cooperation is what people ought to do, but individuals (correctly) believe that people do not live up to these normative expectations. As such, our results reveal that when there is a pronounced divergence between empirical and normative expectations, the latter is not a good predictor of aggregate behavior. The reason is that, in line with the argument by Bicchieri (2006; 2016), individuals' preferences for norm compliance are conditional, rendering their empirical expectations about the norm compliance of others a crucial element for their decision-making.

[10] In the appendix, we provide some suggestive evidence for the importance of individuals' beliefs on others' norm compliance for own norm-following behavior. In particular, we find that when estimating γ_i at the individual level, there is a strong positive correlation between the estimated γ_i and the decision-makers' beliefs about the contribution behavior of their group members (Spearman rank correlation: $\rho = 0.80, p < 0.001$). See Appendix B for further details.

With regard to the determinants of cooperation, our results confirm the view that behavior in social dilemmas is guided by social norms of conditional cooperation (see Fehr and Fischbacher, 2004; Bicchieri, 2006; Fehr and Schurtenberger, 2018). In contrast to previous studies that have only indirectly shown the importance of such a norm, here we provide direct empirical evidence for its existence and relevance for behavior. This is an important finding because, as discussed by Fehr and Schurtenberger (2018), the existence of a social norm of conditional cooperation can explain a large variety of behavioral regularities in the lab and the field, such as the presence of a large number of people who are conditional cooperators, the punishment of free-riders, or the decline of cooperation in finitely-repeated games. Our finding that in simultaneous one-shot games empirical and normative expectations strongly diverge can further explain why in such settings average contributions are typically positive but far below the social optimum. This highlights the importance of empirical expectations for sustaining cooperation, especially in situations in which other solution mechanisms such as punishment are weak or absent (Guala, 2012). Our observation that contributing more than others after having observed their contributions is considered socially inappropriate further provides a rationale for why sometimes people punish anti-socially (Herrmann et al., 2008).

Finally, our findings might also have some policy implications. In particular, our finding that for situations with strategic uncertainty people consider maximal contributions as the most socially appropriate action, opens the door for policy interventions targeted at changing the beliefs about others' cooperativeness, which might be cheaper and easier to implement compared to, e.g., centralized sanctioning systems. Such social information interventions have already shown to be effective in altering behavior, such as tax compliance (Hallsworth et al., 2017; Larkin et al., 2018), energy conservation (Schultz et al., 2007; Allcott, 2011), or water usage (Ferraro et al., 2011; Bhanot, 2018). However, future research should evaluate the importance of these nudging interventions in facilitating cooperation, also because recent research shows that these interventions need to be designed appropriately to ensure long-run effects (Allcott and Rogers, 2014) and to avoid backfiring (Bicchieri and Dimant, 2019).

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Online Appendix

A Additional Tables and Figures

	Others' average contribution					
c_i	Unknown	0	5	10	15	20
0	-0.79 (5.8%)	0.78 (94.6%)	-0.66 (8.6%)	-0.83 (4.3%)	-0.88 (5.4%)	-0.91 (4.3%)
1	-0.78 (4.7%)	0.17 (63.4%)	-0.54 (12.9%)	-0.79 (5.4%)	-0.85 (6.5%)	-0.89 (5.4%)
2	-0.75 (5.8%)	0.11 (61.3%)	-0.45 (16.1%)	-0.77 (5.4%)	-0.83 (7.5%)	-0.88 (6.5%)
3	-0.68 (5.8%)	0.05 (51.6%)	-0.24 (32.3%)	-0.69 (5.4%)	-0.82 (7.5%)	-0.87 (6.5%)
4	-0.61 (5.8%)	0.01 (50.5%)	-0.04 (47.3%)	-0.64 (6.5%)	-0.76 (8.6%)	-0.86 (7.5%)
5	-0.35 (18.6%)	-0.07 (48.4%)	0.86 (97.8%)	-0.47 (16.1%)	-0.70 (8.6%)	-0.80 (7.5%)
6	-0.24 (24.4%)	-0.20 (41.9%)	0.39 (79.6%)	-0.33 (22.6%)	-0.60 (11.8%)	-0.75 (9.7%)
7	-0.19 (25.6%)	-0.20 (40.9%)	0.25 (74.2%)	-0.20 (35.5%)	-0.56 (12.9%)	-0.73 (9.7%)
8	-0.09 (31.4%)	-0.23 (34.4%)	0.11 (63.4%)	-0.04 (51.6%)	-0.48 (16.1%)	-0.67 (9.7%)
9	-0.02 (41.9%)	-0.25 (34.4%)	0.00 (55.9%)	0.15 61.3%)	-0.48 (16.1%)	-0.66 (9.7%)
10	0.28 (76.7%)	-0.28 (33.3%)	-0.13 (46.2%)	0.89 (97.8%)	-0.28 (31.2%)	-0.57 (12.9%)
11	0.31 (81.4%)	-0.38 (24.7%)	-0.27 (32.3%)	0.49 (84.9%)	-0.19 (40.9%)	-0.51 (15.1%)
12	0.35 (88.4%)	-0.39 (24.7%)	-0.27 (32.3%)	0.33 (78.5%)	-0.08 (52.7%)	-0.48 (16.1%)
13	0.40 (88.4%)	-0.40 (24.7%)	-0.28 (31.2%)	0.19 (69.9%)	0.08 (64.5%)	-0.45 (20.4%)
14	0.44 (88.4%)	-0.43 (24.7%)	-0.31 (28.0%)	0.04 (54.8%)	0.23 (67.7%)	-0.36 (31.2%)
15	0.55 (91.9%)	-0.46 (21.5%)	-0.38 (26.9%)	-0.09 (44.1%)	0.89 (96.8%)	-0.18 (41.9%)
16	0.55 (88.4%)	-0.49 (21.5%)	-0.47 (21.5%)	-0.24 (33.3%)	0.48 (82.8%)	-0.06 (49.5%)
17	0.58 (88.4%)	-0.50 (21.5%)	-0.48 (21.5%)	-0.31 (26.9%)	0.29 (77.4%)	0.04 (52.7%)
18	0.61 (86.0%)	-0.52 (20.4%)	-0.51 (21.5%)	-0.36 (25.8%)	0.10 (63.4%)	0.19 (63.4%)
19	0.63 (86.0%)	-0.54 (20.4%)	-0.51 (21.5%)	-0.40 (25.8%)	-0.03 (49.5%)	0.29 (67.7%)
20	0.69 (87.2%)	-0.54 (20.4%)	-0.51 (21.5%)	-0.42 (25.8%)	-0.10 (44.1%)	0.91 (96.8%)

Notes: The first number in each cell shows the mean social appropriateness rating, which is calculated by transforming participants' responses into evenly-spaced numerical scores using the following scale: very socially inappropriate = -1; inappropriate = -0.6; somewhat socially inappropriate = -0.2; somewhat socially appropriate = 0.2; socially appropriate = 0.6; very socially appropriate = 1. The number in brackets displays the percentage of participants that evaluated the action as either somewhat socially appropriate, socially appropriate, or very socially appropriate.

Table A1: Social appropriateness ratings by own and others' contributions

	(1)
Contributions	0.098***
	(0.007)
Contributions × Above ten (d)	-0.057***
	(0.013)
Above ten (d)	0.760***
	(0.133)
Constant	-0.892***
	(0.050)
N	1806
R^2	0.575

Notes: OLS regressions. The dependent variable is the social appropriateness rating. Robust standard errors (clustered at the individual level) are in parentheses. Significance levels * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A2: Social appropriateness when not knowing how much others' contribute

	(1)
Negative deviations	-0.059***
	(0.004)
Positive deviations	-0.031***
	(0.005)
No deviation	0.868***
	(0.027)
N	9765
R^2	0.369
H_0(Neg. dev. = pos. dev.)	$p < 0.001$

Notes: OLS regressions. The dependent variable is the social appropriateness rating. Robust standard errors (clustered at the individual level) are in parentheses. Significance levels * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A3: Social appropriateness of actions in the NoUncertainty treatment depending on deviation from others' contributions

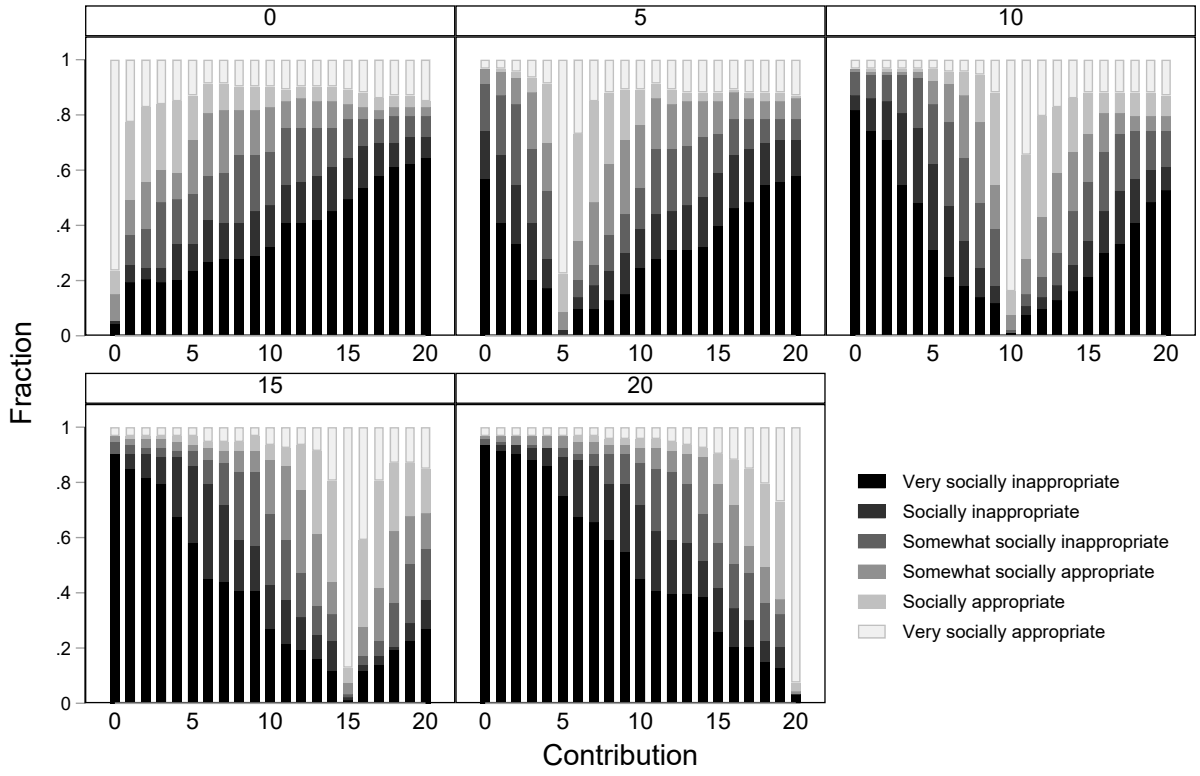


Figure A1: Distribution of social appropriateness ratings in the NoUncertainty treatment, separately for each scenario.

B Individual-level estimation of norm-following

As argued in Section 5.3, the results of our experiment are consistent with the interpretation that individuals exhibit conditional preferences for nor compliance, i.e., they are willing to comply with (injunctive) norms only if enough others (are believed to) do so, too. In what follows, we provide some suggestive evidence for the importance of beliefs about others' norm compliance for own norm-following behavior. To do this, we re-estimate model (2) of Table 1 by using a mixed logit model (Train, 2003), which allows preferences for norm compliance to differ across individuals (see Gächter et al. (2017) for a similar approach.) That is, in contrast to our analysis in the main text in which we constrained γ_i to be the same for all individuals, we now allow for heterogeneity in γ_i. The results from this regression are reported in Table A4. As indicated by the highly significant coefficient of the standard deviation of the norm coefficient, the results confirm that there is substantial heterogeneity in preferences for norm compliance in our sample. While part of this heterogeneity could simply be due to differences in individuals' intrinsic preference for norm-following, some of this variation could also be explained by the fact that individuals hold different empirical expectations about the norm-following of others. To provide some evidence in this direction, we correlate the individual-level estimates of γ_i with the decision-makers' beliefs about the contribution behavior of their group members, as elicited in our choice experiment. We find a very strong and significant positive correlation (Spearman rank correlation: $\rho = 0.80, p < 0.001$), consistent with the notion that preferences for norm compliance are conditional.[11] Note, however, that this finding should be interpreted with some caution because, as we have argued in the main text, a decision-maker's beliefs about the other group members' behavior is not a clean measure for empirical expectations of norm-compliance as these beliefs may be confounded by other (strategic) considerations.

[11] A similar effect might be at play also in our strategy-method experiment, but, unfortunately, we did not elicit beliefs about others' contributions in this context.

	(1)
Monetary payoff	2.283***
	(0.439)
Social appropriateness	21.076***
	(5.129)
Social appropriateness (st. dev.)	25.914***
	(6.410)
Observations	1344
Log likelihood	-174.095
Bayesian IC	369.800

Notes: Mixed logit regressions. The dependent variable is the chosen action in the simultaneous game, which takes value 1 for the contribution that was chosen, and 0 for the other possible contributions that were not chosen. The dataset comprises choices from all $n = 64$ participants of our choice experiment. Robust standard errors, clustered at the individual level, are in parentheses. Significance levels * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A4: Mixed logit estimation of choice determinants for the simultaneous game.

C Experimental Instructions

C.1 Experimental Instructions Choice Experiment

General Information

Welcome and thank you for your participation in this experiment. For your participation and punctual arrival you receive € 4. You can earn an additional substantial amount of money in this experiment. The exact amount you will receive depends on your decisions and the decisions of the other participants. It is therefore very important that you read the following instructions carefully.

General Rules

The results of this experiment will be used for a research project. It is therefore important that all participants follow certain rules of conduct. During the experiment, you are not allowed to communicate with other participants of the experiment or any person outside the laboratory. For this reason, all mobile phones have to be switched off. If you have questions with regard to the instructions or the study, please raise your hand – we will privately answer your question at your place. Disregarding this rule leads to exclusion from this experiment and from all payments.

Anonymity

All decisions are made anonymously, i.e., no other participant learns about the identity of a participant that made a certain decision. Also, the payment is made anonymously, i.e., no participant learns about the payment of the other participants.

Payment

During the experiment, your income will be calculated in points. At the end of the experiment, the total number of points you earned will be converted to Euro at the following rate:

5 points = 1 Euro.

IMPORTANT NOTE: Your payment from this experiment will be credited via bank transfer (except for the show-up fee of € 4 which you will receive in cash at the end of the experiment). It is therefore necessary that you are willing to provide us with information about your bank account. All payments will be executed immediately after the experiment. Yet, the payment date, i.e., the date when the money will be credited to your account (the value date), can vary. In particular, you will receive one part of your payment at an earlier date, and the other part of your payment at a later date. The dates you will receive the two parts of your payment depends on your decisions and the decisions of others. We will email you a confirmation of the bank transfers of all payments within the next two days.

Your bank information will be exclusively used for your payment and does in no respect enter the statistical analysis of this experiment. In particular, at no time will your bank

account information be linked to your decisions in the experiment. After all payments are completed, all bank account information will be deleted.

Course of the experiment

The experiment consists of three parts. You will first receive the instructions for the first part. You receive the instructions for the next part as soon as the previous part is completed. Your total income equals the sum of incomes from all three parts of the experiment. You should therefore take all your decisions seriously.

General Setup

First, we explain the general setup to you. After that, you will be informed about the exact task. At the beginning of part I, all participants are randomly matched into groups of four (4) participants. Each group member receives an initial endowment of 20 points. Then, you are asked to decide how you want to distribute the 20 points. All participants in your group face the same decision situation than you. You can either keep the points for yourself, or you can contribute all or some of them to a group project. Each point that is not contributed to the group project automatically remains in your private account. No other group member benefits from the points in your private account. Each point that you contribute to the group project is multiplied by two and put into the group account. After all group members have made their decisions, the group account is distributed equally among all four group members. This means that all group members will profit equally from the points that you or any another group member contributed to the group account. Your income from the group project is determined by:

$$\text{Income from the group project} = \frac{2 \times \text{sum of contributions}}{4}$$

Your total income is the sum of your income from your private account and of your income from the group project.

$$\begin{aligned}\text{Total Income} &= \text{Income from your private account} + \text{income from the group project} \\ &= 20 - \text{your contribution to the group project} + \frac{2 \times \text{sum of contributions}}{4}\end{aligned}$$

Payments

As outlined at the beginning, your total income will be converted into Euro according to the above mentioned rate. The payment is made as follows:

- The payment of your **income from the private and the group account** is credited **IMMEDIATELY**.

IMMEDIATELY means that we will transfer your income to your bank account immediately after the experiment and that the money will be credited immediately (*please note that in Germany bank transfers can take up to one workday*).

Control Questions

Please answer the following questions. The purpose of these questions is to make sure that all participants have understood these instructions correctly.

Assume that neither you nor any other group member contributes anything to the group project.

Question 1: What is your total income (in points)?

Question 2: What is the total income of each of your three group members (in points)?

Now assume that you and the other three group members each contribute 20 tokens to the group project.

Question 3: What is your total income (in points)?

Question 4: What is the total income of each of your three group members (in points)?

Assume that the other three group members contribute a total of 30 tokens to the group project.

Question 5: What is your total income (in points) if in addition to that, you contribute 0 tokens?

Question 6: What is your total income (in points) if in addition to that, you contribute 10 tokens?

Question 7: What is your total income (in points) if in addition to that, you contribute 20 tokens?

Assume that you contribute 10 tokens to the group project.

Question 8: What is your total income (in points) if in addition to that, the other three group members contribute a total of 10 tokens to the group project?

Question 9: What is your total income (in points) if in addition to that, the other three group members contribute a total of 30 tokens to the group project?

Question 10: What is your total income (in points) if in addition to that, the other three group members contribute a total of 50 tokens to the group project?

Question 11: Points that you and the other group members contribute to the group project

- generate income from the group project that is credited immediately.
- generate income from the group project that is credited in 12 months.
- generate income from the private account that is credited immediately.
- generate income from the private account that is credited in 12 months.

Question 12: Points that you do not contribute to the group project

- generate income from the group project that is credited immediately.
- generate income from the group project that is credited in 12 months.
- generate income from the private account that is credited immediately.
- generate income from the private account that is credited in 12 months.

Instructions Part I

Decision The decisions you make in this part of the experiment are based on the general setup described above. In this part, each group member has to make **two types of decisions** which, in the following, we will refer to as **contribution of type I** and **contribution of type II**.

Contribution of type I

For the contribution of type I, you need to indicate how many of your 20 points you want to contribute to the group project.

Contribution of type II (contribution table)

For the contribution of type II, you need to fill in a table in which you indicate for all possible average contributions of your group members, how many of your 20 points you want to contribute to the group project. You make your contribution decisions on the following screen:

Type II contribution (contribution table)

Your group members' contribution	Your contribution	Your group members' contribution	Your contribution	Your group members' contribution	Your contribution
0		7		14	
1		8		15	
2		9		16	
3		10		17	
4		11		18	
5		12		19	
6		13		20	

The numbers to the left of the blue cells are the average contribution to the group project of the other three group members. Your task is to decide for each of these situations, how many points you want to contribute, if the the other group members contributed 0, 1, 2, 3, ... points, on average. Once you have made an entry in each input box, please click on the "next" button.

After all participants have made both types of decisions, three of the four group members are randomly selected. For these group members, the payment is determined by their contribution of type I. For the group member that has not been randomly selected, the payment is determined by his contribution of type II. The relevant decision is determined by the three type I contributions of the randomly selected group members.

At the time of the decision, you will not know which decision will be relevant for you. You should therefore take all your decisions seriously as any decision can determine your payment.

Reminder:

$$\begin{aligned}\text{Total Income} &= \text{Income from your private account} + \text{income from the group project} \\ &= 20 - \text{your contribution to the group project} + \frac{2 \times \text{sum of contributions}}{4}\end{aligned}$$

Payment

- The payment of your **income from the private and the group account** is credited **IMMEDIATELY**.

Instructions Part II

At the beginning of Part II, all participants are randomly matched in new groups of four. It is ensured that you have not interacted with any of your new group members in Part I.

The general setup in Part II is identical to Part I. As before, each group member receives an initial endowment of 20 points that you can keep for yourself, or that you can contribute completely or partly to to the group project. All group members make their decisions simultaneously. **You make only one decision**. There is not contribution table. Your income is calculated as in the first part of the experiment. Reminder:

Reminder:

$$\begin{aligned}\text{Total Income} &= \text{Income from your private account} + \text{income from the group project} \\ &= 20 - \text{your contribution to the group project} + \frac{2 \times \text{sum of contributions}}{4}\end{aligned}$$

Payment

The total points you earn in Part II will be converted into Euro at the rate described above: 5 points = 1 Euro, and will be added to your income from Part I.

As in Part I it holds that:

- The payment of your **income from the private and the group account** is credited **IMMEDIATELY**.

Instructions Part III

This is the end of Part II. Part III starts now. At the beginning of Part III, the groups are dissolved, i.e., the decisions you will make in this part do not influence the income of the other participants. Also, the decisions of the other participants will not influence your income in this part of the experiment. Your income of this part will be added to your income of Part I and II.

In Part III, you have to make **20 decisions**. In each of these decisions, you can choose between **two options**.

- **Option A** gives you an **immediate payoff of € 50**.
- **Option B** gives you a **higher payoff in 12 months**.

The money amount in Option A is identical for all 20 decisions, while the money amount in Option B changes from decision to decision.

At the end of the experiment, one participant is randomly selected and is paid according to his decisions in Part III. For this participant, the computer randomly selects one of the

20 decisions. The choice in this decision determines the payment date and the payoff from Part III. As before, we will transfer the income from this part of the experiment into your bank account directly after the experiment. The amount will be credited either immediately (in Option A), or in 12 months (Option B).

At the time of your decision, you do not know if you will be randomly selected and which decision is relevant for your payment. It is therefore important that take all your decisions seriously as any decision can determine your payment.

C.2 Experimental Instructions Norm Elicitation Experiment

(*Note: The instructions presented here are those for the* NoUncertainty *treatment. The instructions for the* Uncertainty *treatment are very similar and available upon request.*)

Information about your Participation

Experiment description: You participate in a scientific decision-making experiment. During the experiment you will read instructions, answer questions, and make various decisions that may affect your payout and the payout of other participants.

Participant rights: Your participation in this experiment is voluntary. In order for us to use your data for research purposes, it is necessary that you process all parts of the experiment. You can withdraw from participating in the experiment at any time without having to state any reasons.

Data protection: All data in this experiment is anonymous and does not allow any conclusions about individual participants. There is no connection between your anonymous data in the experiment and the personal data that is stored about you in the participant database of the Cologne Laboratory for Economic Research (CLER) for the purpose of experiment invitation. The data collected in the context of this experiment will be used exclusively for research purposes, and will be stored only for scientific evaluation.

I am aware that I can contact the principal investigator if I want to receive further information about the experiment and that I can contact the principal investigator or the responsible ethics committee if I want to file a complaint regarding my participation.

I agree with these terms and conditions. YES / NO

——— *page break* ———

General Information

Welcome and thank you for your participation in this online experiment. For your participation in this experiment and the complete processing of all questions you will receive a payment of € 2.50. You have further the possibility to earn an **additional amount of money** in this experiment. In the following we will explain your tasks in today's experiment.

General Description of the Task

In a few minutes, you will read the descriptions of several situations. The descriptions correspond to situations in which a person (person A) has to make a decision. For each situation, you will get a detailed description of the possible options person A could choose from when making the decision.

After reading the description of the decision situation, your task is to evaluate every possible action available to person A. **In particular, for each possible action of Person A, we will ask you whether choosing that action is "*socially appropriate*" and**

"*in line with most people's expectations about what Person A should do*" or whether choosing that action is "*socially inappropriate*" and "*not in line with most people's expectations about what Person A should do*". By socially appropriate we mean behavior that you think most people would agree is the "correct" or "moral" behavior. Another way to think about it is that if person A chose a socially inappropriate action, other people would be upset about it.

Based on your answers you can earn money. In particular, for each situation and each possible action, we will ask you to choose the answer that you believe matches the **majority of answers by all participants** in this online experiment. In order to determine your payment, at the end of the experiment, we will randomly select one situation and one possible action by person A. For this situation we will then check which answer was chosen by most participants. If your answer **matches the answer of most other participants, you will receive a payment of € 10**.

We ask you to answer as honestly as possible, based on your opinion of what most participants in this experiment believe is socially appropriate or socially inappropriate behavior.

To show you how to evaluate the different actions, in the following we show you short example.

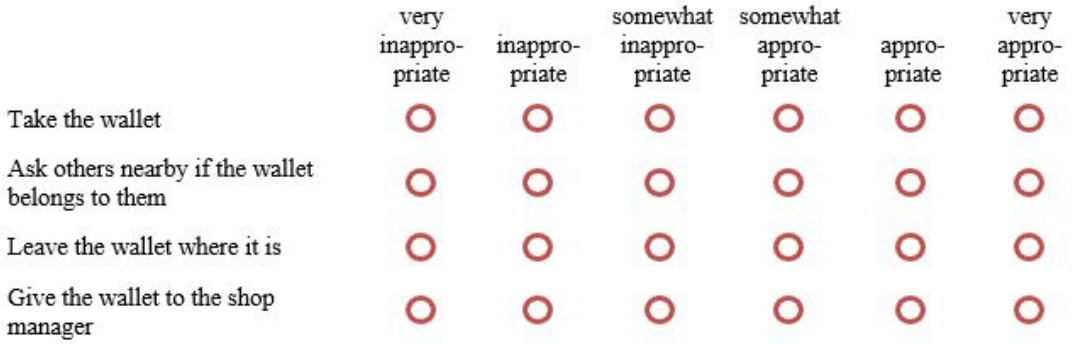
page break

Example

Person A is sitting in a cafe near the university. While there, individual A notices that someone has left a wallet at one of the tables. Individual A must decide what to do. Individual A can choose one of these four options:

- take the wallet.
- ask others nearby if the wallet belongs to them.
- leave the wallet where it is.
- give the wallet to the shop manager.

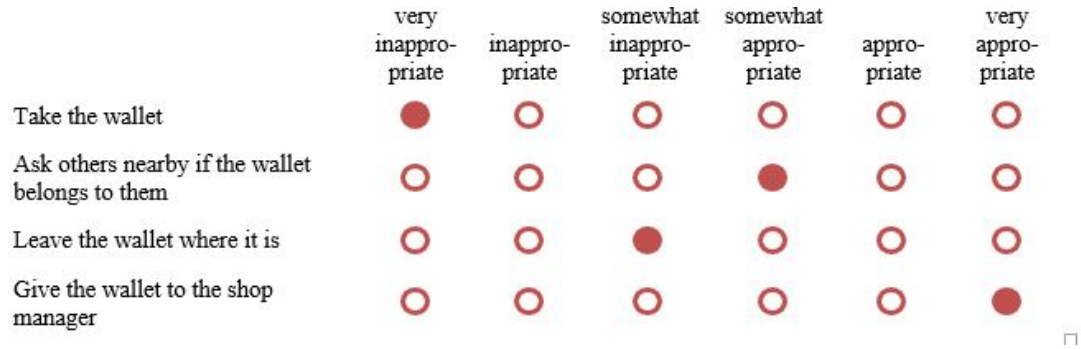
The table below lists all possible actions of person A. For each of these actions, we ask you to indicate whether choosing this action is "*socially appropriate*" and "*in line with most people's expectations about what Person A should do*" or whether choosing this action is "*socially inappropriate*" and "*not in line with most people's expectations about what Person A should do*". You can choose between the following options: very inappropriate, inappropriate, somewhat inappropriate, somewhat appropriate, appropriate or very appropriate. To rate the actions, mark the corresponding option on the scale.



For example, suppose that you believe that most people think

- taking the wallet is very inappropriate
- asking others nearby if the wallet belongs to them is somewhat appropriate
- leaving the wallet where it is is somewhat inappropriate
- giving the wallet to the shop manager is very inappropriate.

In this case your evaluation should look like the following:



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Your Task in today's Experiment

In a few minutes you will read the descriptions of **five situations** in which **a participant in a previous experiment, which was conducted at the Cologne Laboratory for Economic Research (CLER) at the University of Cologne**, had to make a decision. For simplicity, in the following we call this participant **person A**. For each situation you will receive a detailed description of the possible options available to person A when he/she had to make the decision. You are then asked to indicate for each possible action of person A, whether choosing this action is "socially appropriate" or "socially inappropriate". Your answers are entered in a table like in the example above.

Your Payment from today's Experiment

At the end of today's experiment we randomly select one situation and one possible action of person A. Your payment **depends on how similar your answer is to the answer of the other participant in this situation**:

- If your answer in the selected situation **matches** the answer of most other participants, you will receive a **payment of € 10**. For example, if your answer is "very appropriate" and the most frequent answer by the participants is also "very appropriate", then you will receive a payment of € 10.
- If your answer in the selected situation does **not match** the most frequent answer by the other participants, you will **not receive any payment**. For example, if your answer is "very appropriate" and the most frequent answer of the other participants is "somewhat appropriate", you will receive a payment of € 0.

——— *page break* ———

Control Questions

Before we start the experiment, we want to make sure that all participants have fully understood the rules of the experiment and the payments. To do this, we ask you to answer the following questions:

1. If your rating in the selected situation is "socially appropriate" and the rating of most other participants is "socially appropriate", then your payment will be:
2. If your rating in the selected situation is "very socially appropriate" and the rating of most other participants is "rather inappropriate", then your payment will be:

——— *page break* ———

General description of the decision situation in the previous experiment

All five situations in which person A (a participant from a previous experiment) could make a decision are based on the following decision situation:

At the beginning of the experiment, person A was randomly **placed in a group with three other participants**. Each group member received an **initial endowment of 20 points**. Each group member could then decide how to distribute the 20 points. The group members could **either keep the points for themselves**, or they could contribute all or some of them to a **group project**. Each point not contributed to the group project automatically remained in the private account of the group member. **No other group member benefited from the points in the private account**. Each point that was

contributed to the group project was first **doubled**, and then **shared equally among all four group members**. This means that all members of the group benefited equally from the tokens contributed to the group project. The income of a participant therefore was determined as follows:

$$\text{Income from the group project} = \frac{2 \times \text{sum of contributions}}{4}$$

Total Income

$$\begin{aligned} &= \text{Income from the private account} + \text{income from the group project} \\ &= 20 - \text{contribution to the group project} + \frac{2 \times \text{sum of contributions}}{4} \end{aligned}$$

page break

Control Questions

Before we continue with the experiment, we want to make sure that all participants have fully understood the general decision situation of person A and the other participants in the previous experiment. To do this, we ask you to answer the following questions:

Question 1: Assume that **neither person A nor any other group member** contributes any points to the group project. What is the total income (in points) of each group member?

Question 2: Now assume that **all group members (including person A) each contributes 20 points** to the group project. What is the total income (in points) of each group member?

Question 3: Now assume that the three group members together contribute **a total of 30 points** to the group project. What is the total income (in points) of person A, if **person A contributes 0 points**?

Question 4: Now assume that the three group members together contribute **a total of 30 points** to the group project. What is the total income (in points) of person A, if **person A contributes 10 points**?

Question 5: Now assume that the three group members together contribute **a total of 30 points** to the group project. What is the total income (in points) of person A, if **person A contributes 20 points**?

page break

Decision Situation of Person A

The exact decision situation in the previous experiment was as follows:

- First, the three group members had to simultaneously decide how many points (between 0 and 20) they want to contribute to the group project.
- After that, **person A was informed about the average contribution of the other three group members**.
- Then, **person A could decide himself/herself**, how many points he or she wants to contribute to the group project.

After person A took his/her decision, the experiment was finished.

Payments of the Participants

At the end of the previous experiment, the point income of the participants was first converted into Euro. Afterwards, the participants received their payments via bank transfer.

page break

Control Questions

Before we continue with the experiment, we want to make sure that all participants have fully understood the decision situation of person A in the previous experiment. To do this, we ask you to answer the following questions:

Question 1: When deciding on how many points to contribute to the group project,

- ☐ person A was informed about the average contributions of the other group members.
- ☐ person A did not know how many points the other group members had contributed.

Question 2: The point earnings

- ☐ were paid to participants in cash at the end of the experiment.
- ☐ were transferred to the participants' bank account immediately after the end of the experiment.

page break

Estimation Task

In the following, we ask you for your assessment of the behavior of the participants in the previous experiment. With your assessment you can earn an additional amount of money, which will be paid out to you together with your other earnings.

In particular, we will ask you to estimate how many points participants in the role of person A contributed **on average in each of the five situations to the group project**. With your estimate you can earn **€ 2**. To determine your earnings, at the end of the experiment, we will pick one out of the five situations at random. After that, we will compare your estimate with the actual behavior of participants in the role of person A, which we already collected. **The closer your estimate is to the actual contribution behavior of participants in the previous experiment, the higher the probability that you receive the € 2**. This is determined using the following formula:

$$\text{Probability for € 2 (in \%)} = 100 - (5 \times (\text{Estimate - actual contributions}))^2$$

This means that the difference between your estimate and the true value is first multiplied by five and then squared. This number is then subtracted from the maximum possible probability of 100%. While this formula might seem complicated, the underlying principle is very simple: the smaller the difference between your estimate and the true value, the higher the likelihood that you win the € 2.

Notice that the probability of winning only depends on the absolute difference. Thus, it doesn't matter for your payment whether you overestimate the true value by, say, one or underestimate it by one unit.

On the next page you see an overview of all five situations. Please make an entry for each of these situations.