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# Dictating the Risk: Experimental Evidence on Giving in Risky Environments†

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*We study if and how social preferences extend to risky environments. We provide experimental evidence from different versions of dictator games with risky outcomes and establish that preferences that are exclusively based on ex post or on ex ante comparisons cannot generate the observed behavioral patterns. The more money decision-makers transfer in the standard dictator game, the more likely they are to equalize payoff chances under risk. Risk to the recipient does, however, generally decrease the transferred amount. Ultimately, a utility function with a combination of ex post and ex ante fairness concerns may best describe behavior.* (*JEL* C72, D63, D64, D81)

The effects of generosity are often subject to uncertainty. When deciding to give to charity, donors may not perfectly know how their money will be spent and if the intended effects will occur. Physicians exert (costly) effort in order to increase their patients' *chances* to be healed, and parents may choose safe or risky options to invest or save for their children. As a more extreme example, police officers that offer themselves as a replacement for hostages taken by criminals redistribute risk from the hostage to themselves. At the policy level, the same pattern of risky consequences of giving applies. Consider climate policy. Sure abatement costs for the current generation have uncertain benefits for future generations, as benefits depend on the sensitivity of the climate to the atmospheric stock of greenhouse gases. Common to all these examples is that a decision maker forgoes some benefits in order to increase payoff chances of others, rather than transferring income for sure. In this paper, we study how the riskiness of such transfers affects giving decisions.

With this, we contribute to a large experimental and behavioral literature that investigates potential social behavior of subjects: dictator, gift exchange, public good and other games show that some subjects are willing to transfer money to other players without receiving any material benefits in return (see Camerer 2003; Schokkaert 2006). Such giving decisions are often interpreted as a preference for equitable or efficient outcomes (Fehr and Schmidt 1999; Charness and Rabin 2002; Engelmann and Strobel 2004), as a preference for giving (Andreoni 1990), or as a desire for being seen as behaving fairly (Andreoni and Bernheim 2009; Benabou

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and Tirole 2006; Dana, Weber, and Kuang 2007). Surprisingly little thought has been given so far to the role of risk in giving decisions or to if and how such social preferences extend to environments of risky decision making.

In this article, we report experimental results from variations of a standard dictator game that capture different variants of risky transfers. By studying giving decisions in risky environments, we address the question of whether individual perceptions of fairness relate to comparisons of outcomes/payoffs or rather to comparisons of opportunities, i.e., to ex post versus ex ante comparisons. The finding that some subjects display nonselfish behavior, e.g., choose a 50–50 split in dictator games, is the basis for theories on inequality aversion with respect to final payoffs (see Fehr and Schmidt 1999; Bolton and Ockenfels 2000). Falk, Fehr, and Fischbacher (2008) show that besides distributional preferences on the fairness of outcomes, the interpretation of fairness intentions plays an important role in subjects' decisions. Another strand of the literature considers ex ante fairness. Machina (1989) provides a classical example: a mother with two children may be indifferent between allocating the indivisible treat to either of her children, but she may strictly prefer giving the treat based on the result of a coin toss. Although being a fair procedure, as it gives both children the same chance to win, it will not result in a fair outcome as only one child can get the treat (see also Kircher, Ludwig, and Sandroni 2009; Trautmann 2009). Just as in this example of not discriminating between the two kids, the ethical debate on ex post versus ex ante fairness is usually rooted in normative considerations (e.g., Grant 1995). In this article, we yield new insights into this debate by considering the *choices* of individuals who are themselves directly affected by the outcome. That is, rather than deciding the allocation between two other persons as in Machina's example, the decision maker decides the allocation between herself and one other person. Doing so allows us to discuss how social preference theories may extend to risky situations.

To explore the determinants of giving under risk, we run a series of modified dictator games. We first replicate the standard dictator game.[1] This standard dictator game highlights the decision maker's fairness in outcomes between the recipient and himself. We are interested in whether this fairness in outcomes translates into ex ante fairness in risky situations. Our modified treatments coincide with the standard dictator game in terms of expected payoffs. The payoff to the decision maker or to the recipient or to both is, however, subject to risk. For example, we consider treatments in which the dictator receives a certain amount of money, but the recipient does not. By sacrificing some of his monetary payoff, the dictator can increase the recipient's chance to win a prize. If the dictator does not give any money, then the recipient will definitely not get the prize. If he gives the maximal amount, the recipient wins the prize for sure. Another set of treatments involves a transfer of lottery tickets. This situation is similar to the mom's example, only that the decision maker needs to choose the *probability* with which *she herself* or the other person wins the prize (i.e., the treat). That

[1] A vast literature has been devoted to studying giving behavior in such games in which one player (dictator) is asked to allocate a certain amount between himself and another player (recipient). While any dictator who is solely maximizing his or her own payoff should keep the entire endowment, Kahneman, Knetsch, and Thaler (1986) were first to show that most subjects choose an even split giving $10 to each player over an uneven split ($18, $2) that favored themselves. Following the first dictator experiment with a continuous choice (Forsythe et al. 1994), most studies show that a significant proportion of dictators give positive amounts (for summary see Camerer 2003). List (2007) shows that if taking is allowed, fewer but still a significant portion of players do not choose the selfish outcome.

is, the decision maker dictates the allocation of *chances* to win a given prize: giving zero secures the prize to the dictator and increasing giving increases chances of winning for the recipient while decreasing the dictator's chances. These treatments allow us to evaluate whether—when valuing equality—individuals compare their outcomes *after* resolution of uncertainty (ex post comparison) or if they compare their ex ante chances to gain certain incomes (ex ante comparison): no player who solely considers ex post distribution of payoffs would give a positive amount if the lottery draws are exclusive, i.e., if only one of the players wins the prize. We complement these treatments with one in which the dictator *cannot* change the expected value allocated to himself and the recipient, but only their exposure to risk.

In our results we first establish that social preferences of most players who give nonzero amounts in a standard dictator game cannot be based on ex post payoff comparisons only. Rather, subjects are found to also take into account an ex ante comparison of the chances to win. Decisions are, however, affected by the riskiness of final payoffs: decision makers generally give up less income than in the standard dictator game if the transfer is risky, that is, if it does not increase the recipient's income for sure but only her chances to gain income. Importantly, the propensity to give in a standard dictator game is a good predictor for giving in risky situations: those who transfer more money in the dictator game are more likely to equalize the ex ante situation, i.e., payoff chances in other games. Our results thus bring to light how existing theories of social preferences can extend to risky contexts.

The extension of social preferences to risky situation has received some recent interest in the literature: Fudenberg and Levine (2011) provide an axiomatic approach to model social preferences that include fairness measures that are defined on ex ante versus ex post comparisons. They show that ex ante fairness usually violates the independence axiom and therefore does not fit in an expected utility framework. They provide an example of extending Fehr and Schmidt (1999) preferences by using a linear combination of ex post and ex ante comparisons.

Our article is also related to a couple of recent papers that experimentally examine the role of social preferences for risk taking. Bolton, Brandts, and Ockenfels (2005) use ultimatum and battle-of-the-sexes games to look at the trade-off between how an outcome is determined and the fairness of the outcome from recipients' perspectives. Relatedly, Bohnet and Zeckhauser (2004) and Bohnet et al. (2008) analyze how recipients in a risky dictator game adjust acceptance rates depending on whether an actual person or a random process determines the outcome of the game. Unlike these authors, however, we use variations on ordinary dictator games and study the dictator's allocation choice rather than recipient preferences to see how giving decisions are affected by risk. Thus, in our setting the recipient is a completely passive player. In that sense our work builds on Bolton and Ockenfels (2010) who explore how dictator choices between a safe and a risky option for themselves depend on the corresponding payoffs to the recipient. In their experiments, dictators have a binary choice between a safe payout option and a risky payout option. They do not vary the degree of risk in the risky options. They find that dictators tend to be more risk averse when the risk applies to themselves as well as to others. They also find that dictators prefer the risky situation over a situation where outcomes are unfair with certainty. While this study reveals that decision makers are sensitive to risk borne by recipients, it falls short of addressing the degree to which dictators are willing to surrender their own sure gains in order to reduce the risk of a partner. We address this by giving decision makers a continuous choice set and varying the distribution of risky versus certain outcomes for the dictator and the recipient, respectively. Cappelen et al. (2011) also investigate trade-offs between safe and risky options. Importantly, they distinguish between ex ante and ex post fairness motives of decision makers by allowing for redistribution after the resolution of risk. They find evidence in favor of preferences for ex ante fairness motives, but also show that ex post redistribution takes place, thereby indicating mixed motives of individuals.

The paper closest to ours is Krawczyk and Le Lec (2010) who also explore ex ante (procedural) and ex post (consequentialist) notions of fairness. Independent of our study, they use a set of variations of the dictator game to distinguish these concepts when outcome is probabilistic. Their competitive and noncompetitive conditions with symmetric prices correspond to our treatments that allocate chances to win the prize when outcomes are determined dependently (one lottery and one winner) or with independent lotteries. They also find a significant portion of subjects giving in the competitive treatment, indicating that a significant portion of subjects also is driven by ex ante, rather than ex post fairness concerns. However, Krawczyk and Le Lec (2010) concentrate on situations where both subjects face risk or both subjects face certain payoffs. In our paper, we additionally vary the dictator's own risk exposure and her ability to achieve ex post fairness. We are thereby able to distinguish how one's own risk exposure affects his generosity in allocating risk to other players; in other words, we can compare how people behave under risk allocation and under risk sharing problems.

Other papers that have risk components in dictator games are Klempt and Pull (2010) and Andreoni and Bernheim (2009). In both papers, the risk itself is fixed while the information available to dictator and recipient varies. Klempt and Pull's uninformed dictator treatment evaluates dictator behavior when the dictator does not know how his choice will translate to payoffs but does know the risk involved. The authors find that uninformed dictators tend to allocate more to themselves than when they are informed. The authors interpret this as suggesting that dictators hide their selfishness behind risk. Andreoni and Bernheim (2009) conduct experiments that obscure the role dictators play in determining payoffs. They allow for either the dictator or "nature" to determine the recipient's pay out, where the probability of nature deciding is fixed, as is the payment if nature decides. Further, recipients know only their final payment; they do not know whether it was decided by a person or by nature. Dictators typically settle on the fixed amount nature would pay if nature was deciding, hiding their greed behind the recipients' lack of information, similar to Klempt and Pull's study. While considering effects of risk on giving, both studies cannot fully differentiate between ex ante and ex post notions of inequality.[2]

In our study, we close this gap in the literature by carefully designing the experimental treatments to be able to differentiate between two fairness notions. By observing decision makers in a series of dictator choices, where payoffs equal those in the standard dictator game in terms of expected value, we are able to identify if dictators give because they are considering ex post outcome inequality or inequality

[2] In fact, Andreoni and Bernheim note that "concerns for ex ante fairness are … confounds in the context of our current investigation" and purposefully exclude it from their experimental design.

of ex ante payoff chances. We further observe to what extent giving in nonrisky situations is predictive of how dictators behave when risk is involved. We believe that our study contributes substantial new insights on social preferences under risk.

The article is structured as follows. In Section I, we motivate and describe the principle features of our experiment. Section II sets up the experimental design in detail. We discuss our experimental findings in Section III and relate those to the existing literature. Section IV concludes.

## I. Ex Ante versus Ex Post Comparison

Existing models of social preferences consider individual preferences over certain payoffs, represented by a utility function $u(c^1, c^2)$ where $c^1$ and $c^2$ are the (final) consumption levels of persons 1 and 2, respectively. Charness and Rabin (2002) define $u(c^1, c^2)$ as a combination of concerns for own payoff, minimum payoff, and efficiency. Fehr and Schmidt (1999) and Bolton and Ockenfels (2000) study inequality aversion and let $u(c^1, c^2)$ capture aversion toward payoff *differences*. For example, Fehr and Schmidt (1999) posit a model of inequality aversion that compares the final payoffs of individuals:

$$u(c^1, c^2) = c^1 - \alpha \max[0, c^2 - c^1] - \beta \max[0, c^1 - c^2] \tag{1}$$

with $0 \leq \alpha$, $\beta \leq \alpha$, and $\beta \leq 1$. None of these authors explicitly looks at how these kind of social preferences extend to situations under risk.

To address these issues, we consider individual preferences over joint payoff distributions $F(c^1, c^2)$. There exist two straightforward ways of extending social preferences as given by $u(c^1, c^2)$ to situations under risk, i.e., to preferences over lotteries $F(c^1, c^2)$ (see also Fudenberg and Levine 2011).

First, individuals may evaluate lotteries by their expected utility:

$$W^{\text{ex post}}(F) = \int u(c^1, c^2)\, dF(c^1, c^2). \tag{2}$$

Fehr and Schmidt (1999), for example, appear to interpret their inequality aversion in risky situations under such an assumption of expected utility maximization. Note that this implies that inequality-averse individuals compare the final payoffs to them and the other person. We therefore refer to the extension in (2) as the *ex post comparison*.

This extension of social preferences to risky situations does, however, not capture preferences as illustrated in an adaptation of Machina's example to an allocation of an undividable object between the decision maker and the recipient: here, any outcome leads to ex post inequality and the final allocations are $(c^1, c^2) = (1, 0)$ or $(c^1, c^2) = (0, 1)$. If the decision maker has preferences based on (2) and at least marginally prefers ex post inequality in her own rather than the other person's favor, she would choose an allocation of risk that secures the object to herself. Differently, suppose the decision maker has a preference for ex ante fairness and is willing to accept the inequitable outcome as long as it is decided upon fairly (as in Bolton and Ockenfels 2010). Then, she might want to avoid ex ante inequality and choose an allocation of risk that gives equal chances to the decision maker and the other person to obtain the object. For example, 50-50 gamble would equalize the chances to win the item and therefore avoid inequality from an ex ante perspective.

In order to formalize preferences on ex ante comparisons of payoff chances, we assume that each agent's utility is a function of expected payoffs for both himself $(E(c^1))$ and his partner $(E(c^2))$ where the expectations for person one and person two are evaluated over the lottery $F$.[3] Then, the second possible extension of social preference to risky situations is given by

$$W^{\text{ex ante}}(F) = u(E(c^1), E(c^2)). \tag{3}$$

More generally, both ex ante and ex post comparisons may enter the utility of an agent such that we write the general utility function as

$$W(F) = \int w(c^1, c^2, E(c^1), E(c^2))\, dF(c^1, c^2) \tag{4}$$

with some appropriately defined function $w(\cdot, \cdot)$. Fudenberg and Levine (2011) give the example of a linear combination of (2) and (3) for the case of Fehr and Schmidt preferences:

$$\gamma \int u(c^1, c^2)\, dF(c^1, c^2) + (1 - \gamma) u(E(c^1), E(c^2)) \tag{5}$$

with $\gamma \in [0, 1]$. Our experimental treatments are designed to differentiate between the preference structures that are exclusively based on ex post or ex ante comparisons as formulated in (2) and (3). In particular, all our treatments coincide in ex ante expected values such that any theory that is based exclusively on ex ante comparisons as in (3) will not be consistent with observations that vary across treatments.[4]

We will see that neither a theory that exclusively is based on ex ante nor one that exclusively is based on ex post comparisons can fully describe the behavior of individuals. As a consequence, a more comprehensive approach as indicated in (4) is warranted.

## II. Experimental Design

Our experiment consisted of a series of dictator games in which the dictator must allocate 100 tokens between himself and a second player (recipient). We report the

[3] More generally, individuals may not just compare the expected value, but—for example—may also compare the certainty equivalent of payoff chances. For illustrating the differences between ex post and ex ante comparison, however, we concentrate on a simple, and in some ways more straightforward, comparison of expected values (see also Fudenberg and Levine 2011; Trautmann 2009). It should be noted that a similar distinction between ex ante and ex post comparisons has been made in the literature on social welfare functions. Similarly, one could interpret individual preferences on fairness and inequality as individuals partially incorporating social welfare concerns in their own preferences. Recently, Chambers (2012) studies social welfare functions that incorporate inequality aversion with respect to certainty equivalents.

[4] In the Appendix, we use the Fehr-Schmidt preference structure (1) for convex combinations of ex post and ex ante comparisons (5) as an example to derive testable predictions for the different treatments. The qualitative predictions for differences between treatments in our experiment are identical if the Charness and Rabin (2002) approach is used instead.

results of six choice tasks. Tasks differ according to the payoff consequences for each of the players. One of the tasks replicates the standard dictator game. In the other five tasks, the dictators allocate risk for their recipient counterparts or between themselves and their counterparts.

We conducted our experiment in September of 2009 in the Experimental Economics Laboratory at the University of Maryland. A total of 152 subjects were recruited from among University of Maryland undergraduates representing a variety of undergraduate majors, including but not limited to economics, finance, chemistry, government, and biology. Subjects first gathered in one room where they reviewed consent forms. After signing a consent form, all subjects were given a copy of the general instructions, which were also read aloud by an experimenter. Subjects were randomly assigned to be either person 1 (dictator) or person 2 (recipient).[5] The dictator subjects were then led into a separate room. The recipient subjects remained in the first room. Each dictator was randomly matched with one recipient without revealing the identity to either of the subjects. No subjects were permitted to communicate before or during the session. An experimenter was present in each of the two rooms for the duration of the experiment. A copy of the instructions can be downloaded from the journal's website.

All subjects participated in all six choice tasks; consequently our results are within rather than between comparisons. Dictators submitted all of their allocation decisions via computer and did not learn of the outcomes of their choices between rounds. Computer stations were randomly assigned. We also randomized the order of tasks for each dictator to minimize order effects.[6]

The receivers filled out decision forms using pen and paper and also did not learn dictator choices between rounds. Their task was to determine how much they *expected* their dictator partner to allocate to them for each task. The recipients' decisions had no bearing on the final allocations, and this was made clear before each session began. Dictators did not learn recipients' expectations, either between tasks or at the end of the experiment. Similarly, recipients did not receive feedback on decisions by the dictators. It should be noted that the recipient task was not incentivized; there were no consequences for reporting beliefs inaccurately, but there were also no reasons for recipients not to disclose their true beliefs. Receivers earned the same participation fee as dictators and also earned whatever their randomly matched partner allocated to them in a randomly selected payment round. Because the receiver task was somewhat informal, we do not provide a rigorous exposition of these results. Rather, outcomes from the recipient task are largely exploratory.

After all subjects completed all tasks, payment was determined from one randomly selected task round. Using the computer, we selected payment rounds independently for each dictator-recipient pair. We did not reveal which round was the randomly selected payment round or what the dictator choice was in that round. Thus, subjects did not learn the outcomes of their choices at any time during or after the experiment. They learned only of their final earnings. Likewise, the recipients did not know if their final earnings were the result of a kind (or unkind) dictator or due to a lottery. Subjects received $1 in cash at the end of the session for each

[5] In the experiment, the words "dictator" and "recipient" were not used.

[6] We also tested for order effects and did not find any evidence that our results depend on the order in which tasks were performed.

ten experimental currency units (ECU's) they earned in the randomly selected task round. A $5 show-up fee was included in the subject payments, which were paid at the end of each session. Dictators and receivers were paid separately and in private.

### A. *Description of Tasks*

In each task, the decision maker was asked to allocate 100 tokens between himself and the recipient, giving away $x \in [0, 100]$ and keeping $100 - x$ tokens. The payoff consequences differed between tasks and were denoted in Experimental Currency Units (ECU) during the experiment ($100\text{ECU} = 10\text{USD}$). Table 1 summarizes the payoff consequences for each task.

Task 1 (*T1*) replicates the ordinary dictator game, as a baseline for comparison with risky decisions: the players' payoffs are given by $(c^1, c^2) = (100 - x, x)$. The purpose of this task is to position our results within the existing work on the dictator game, as well as to serve as a benchmark for other tasks.

In Tasks 2 and 3, the dictator allocates tokens as in Task 1, but unlike Task 1 the tokens given to the recipient represent lottery tickets. Tokens kept by the dictator are interpreted the same as in Task 1. More formally, in Tasks 2 and 3, the dictator receives a certain payoff in ECU equal to his allocation of tokens kept, $c^1 = 100 - x$, while giving the recipient the chance to win a prize. The recipient earns the prize of $P = 100$ tokens with probability $\pi(x) = x/100, x \in [0, 100]$, in *T2*. In *T3* the recipient can win the prize $P = 50$ tokens with probability $\pi(x) = x/50, x \in [0, 50]$. Thus, in these two treatments the dictator does not face any risk himself. For the recipient a lottery is drawn to determine if he receives the payment. *T2* and *T3* resemble situations as described in the introduction, for example, a physician's costly effort to increase the healing chances of patients or bearing greenhouse gas abatement costs to reduce climate change faced by future generations.

We can attribute any difference between the dictator's decisions in *T2* and *T3* and the standard dictator game (*T1*) to his assessment of the risk to the recipient, as both the dictator's payoff and the recipient's expected value are identical. For the combination of ex post and ex ante comparisons as outlined in (5), in the Appendix we derive the prediction based on Fehr-Schmidt preferences that giving in *T2* should be positive but less than in *T1* if agents put sufficient weight on ex post comparisons.[7] The reason for this is that if the recipient wins, he receives a higher payoff than the dictator. *T3* avoids this unfavorable inequality as the recipient can win only a maximum of $c^2 = 50$. If agents are therefore largely driven by ex post inequality concerns, we should expect more giving in *T3* than in *T2*. For the Fehr-Schmidt formulation as given by (1) and (5), we show that giving in both these treatments should roughly coincide with giving in *T1*, with *T2* giving being dependent on the strength of the ex post inequality concerns.

[7] Note that the Fehr-Schmidt model is linear in payoffs and therefore resembles risk-neutral decisions. A risk-averse dictator with preferences based on ex ante comparisons (3) would evaluate the certainty equivalent to the recipient below the expected value. If the dictator is interested in efficiency (e.g., the sum of certainty equivalents), he would therefore give less in *T2* than in *T1*. If he is interested in equalizing ex ante chances by equalizing the certainty equivalents, he might allocate more tokens to the recipient. The reverse holds for risk-loving agents. If, on the other hand, the agent compares ex post payoffs and is highly averse to unfavorable inequality, he would reduce giving in *T2* compared with *T1*.

Task 4 (*T4*) aims to test whether preferences based on ex ante or ex post comparisons are more appropriate to model dictators' allocation decisions under risk. In this treatment, both the dictator and recipient face risk. Here, the dictator distributes the *chances* to win a prize. The probability for winning the prize of $P = 100$ are given by $\pi^1(x) = 1 - x/100$ and $\pi^2(x) = x/100$. Thus, the token allocations represent the chances of winning a lottery. In Task *T4*, the draws are dependent: either the dictator or the recipient wins. Again, Task *T4* was designed to differentiate between preferences based on ex ante and ex post comparisons. Note that ex post formulations of preferences as in (2) imply

$$W^{\mathrm{T4,ex\ post}}(F) = (100 - x/100)u(100, 0) + (x/100)u(0, 100)$$

such that for any preference with $u(100, 0) > u(0, 100)$ we expect subjects to choose $x^{\mathrm{T4}} = 0$. As long as agents put slightly more weight on their own than on others' payoffs, we have a clear theoretical prediction. Note that this assumption is satisfied by all models in the literature (e.g., Fehr and Schmidt 1999, Charness and Rabin 2002). Furthermore, this prediction would also hold for specific nonexpected utility models: for example, if agents have rank-dependent preferences or weigh utility in a nonlinear way, $x^{\mathrm{T4}} = 0$ would result as long as the utility functional, $W$, is strictly monotonic in the objective probability $x$.

Conversely, if agents have preferences based on ex ante comparisons as in (3), they may give positive amounts. For example, subjects that try to avoid inequality in expected payoffs are expected to choose $x^{\mathrm{T4}} = 50$.[8] For the combination of ex post and ex ante comparisons as outlined in (5), we show in the Appendix that, based on Fehr-Schmidt preferences, inequality-averse subjects are less likely to give if their weight on ex post comparison increases. If they give, they are predicted to give 50.

Task 5 (*T5*)[9] is identical to Task *T4* except that instead of one lottery, two independent lotteries are drawn, one for each player. Here, one of the players, both players, or neither of them wins the prize. In terms of ex post comparisons, *T4* and *T5* therefore differ. In terms of ex ante expected payoff, these tasks are the same. Comparing *T4* and *T5* therefore may provide us with further evidence in favor of or against ex ante comparisons. Note that the prediction under ex ante considerations is clear for this comparison, but the same is not true of ex post considerations. This is because of potential second-order uncertainty in *T5*—while the dictator can discover whether or not he will win the lottery in *T5*, he does not know if his partner wins. Consequently, if giving in *T4* and *T5* is the same, we interpret the result as support of ex ante based preferences, rather than as a definitive test. In the Appendix, we show that Fehr-Schmidt preferences defined by (1) and (5) lead to identical giving decisions in *T5* and *T2*.

We complement these five treatments with one additional task, *T6*, in which the dictator cannot change the expected value allocated to herself and recipient but can

[8] Note that the same prediction of zero giving would result in the standard dictator game because of identifiable actions. In *T4* and *T5*, however, a zero payoff to the recipient could result even if the dictator gave all but one token to the recipient. Consistent with Dana, Weber, and Kuang (2007), we would then also expect less giving in *T4* and *T5* than in *T1*.

[9] Engel (2011) discusses positive sum games (like our *T5*) and the strategy method (asking each dictator to identify binding choices for several games, in each case conditional on nature not intervening, and then choose one game at random to determine the outcome).

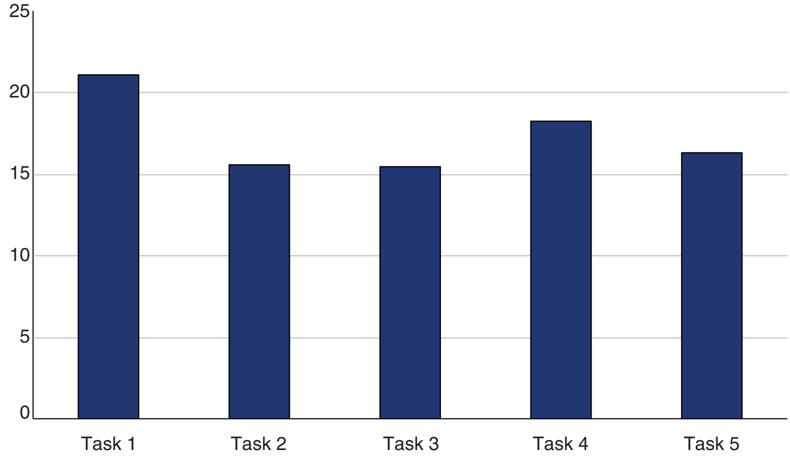


Figure 1. Average Contribution by Task

change the risks involved. The potential allocations are a 50-50 gamble between $x/2$ and $100 - x/2$ for person 1 and a 50-50 gamble between $50 - x/2$ and $50 + x/2$ for person 2. Independent lotteries are drawn for each player to determine if he wins the high or low ECU amount. The purpose of this final treatment is to gain insights into whether social preferences affect the allocation of risks consistently with the allocation of expected payoffs. As such, predictions for Task *T6* complement those in *T4*. Ex ante equality in chances would be generated by a choice of $x^{T6} = 50$ for which both players face a gamble between 25 and 75. We would therefore expect players with preferences based on ex ante comparisons who choose to give larger amounts in the standard dictator game to choose an allocation close to $x^{T6} = 50$.[10] If, however, dictators are fully selfish (they give nothing in the dictator game) we would expect $x^{T6} = 100$ if they are risk averse and $x^{T6} = 0$ if they are risk loving. We thus predict that decisions in Task *T1* should be informative of the absolute distance between decisions in *T6* and 50.

In all treatments, recipients were not informed about the actual choice, $x$, but about only their own final payoff. Dictators did not receive direct information about the final payoff to the recipient. The effect of such information on giving decisions is left to further research.

## III. Experimental Results

The results on the dictators' choices and the recipients' expectations are summarized in Tables 2 and 3. These tables provide the summary statistics of average choices as well as the proportion of players choosing $x = 0$ or $x = 50$ in each task. For example, average giving in the dictator game is $x = 21.07$ and thereby consistent with numbers reported in the literature (Camerer 2003). It can immediately be seen that significant positive giving occurs for all tasks. Figure 1 again shows the average contribution by task, while Figure 2 displays the percentage of subjects giving

[10] In Appendix B, we show that Fehr-Schmidt preferences defined by (1) and (5) lead to $x^{T6} = 50$, independent of the degree of inequality aversion.

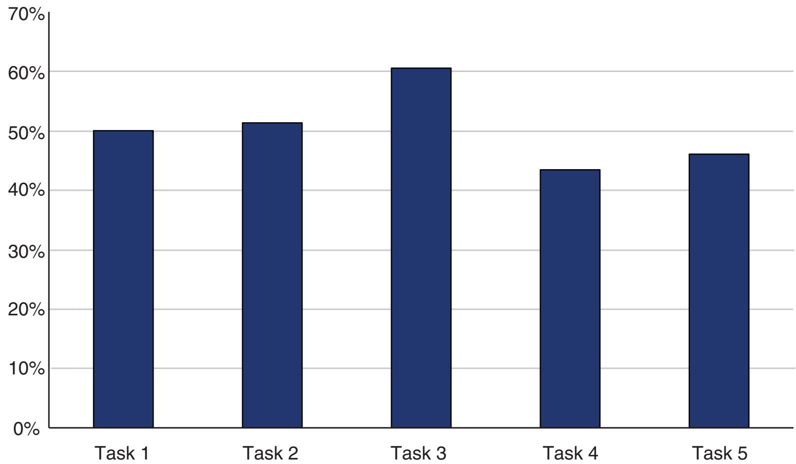


Figure 2. Percent of Subjects who Choose to Give Nonzero Amounts

nonzero amounts (participation rate), and Figure 3 shows the average contributions for those who chose to give nonzero amounts. The summary statistics of these conditional contributions are given in Table 4. Notably, the figures already show important differences between treatments. We explore those in detail below.

In a first step, we can study giving decisions in *T4*. Here, giving is significantly different from zero: 33 subjects (43 percent) chose to give positive amounts, which amounts to an average contribution of $x = 18.04$ (significantly different from zero based on Wilcoxon test, *t*-test, all 1 percent significance).

We therefore can clearly reject the hypothesis that preferences based exclusively on ex post comparisons are able to explain their behavior.

RESULT 1: *Preferences based exclusively on ex post payoff comparisons cannot explain giving decisions under risk.*

This finding is consistent with an ex ante comparison of payoff consequences and cannot be explained by any preference structure that solely relies on ex post comparisons.

In fact, the percentage of agents with positive giving and the contributions in *T4* do not significantly differ from those in the standard dictator game. For Task 4 there is slightly more mass on $x = 0$ than for Task 1 (50 percent versus 57) and slightly less mass on $x = 50$ in Task 4 than for Task 1 (22 percent versus 16 percent). While this is consistent with some players putting weight on ex post comparison as described in the predictions (also see Appendix), the difference is found to be insignificant (using Wilcoxon signed-rank tests on the binary variable for $x = 0$ and $x = 50$, respectively).

The conditional contributions are given in Figure 3 and Table 5 panel A (differences between treatments checked using Wilcoxon test). The average contributions are given in Table 5 panel B (test for differences using Wilcoxon test).[11]

[11] The unconditional sample includes those who did not give positive amounts in either treatment being compared, and, thus, averages are skewed by the concentration of giving at zero. Nonetheless, the directions of

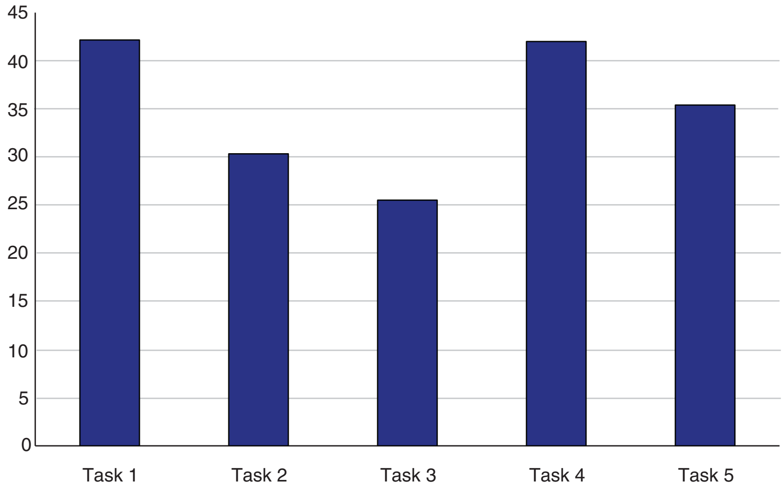


Figure 3. Average Tokens Given, Conditional on Giving Greater than Zero

In line with the interpretation of preferences as primarily driven by ex ante comparisons is the apparent similarity between *T4* and *T5*. The comparison between *T2* and *T3* also informs whether or not dictators evaluate ex post payoff differences only. As is discussed in the description of the tasks, if agents are largely driven by ex post inequality concerns, we would expect more giving in *T3* than in *T2*. We find the opposite to be true, however: conditional on giving, *T2* has a significantly higher mean than *T3* (Wilcoxon test, 5 percent).

Our within-subjects design allows us to study how giving in the dictator game is correlated with giving in the other treatments. In fact, if agents' preferences were exclusively based on comparisons of ex ante expected value, treatments *T1* to *T5* would coincide such that larger giving in *T1* should lead to more giving in the other treatments. In *T6*, the dictator faces a 50-50 gamble between $x/2$ and $100 - x/2$ while the recipient faces potential outcomes of $50 - x/2$ and $50 + x/2$. As such, the decision x does not affect the expected value for both players, but it does impact the risk allocation. For $x = 50$, both players face the same payoff chances. An ex ante oriented player who allocates more to the recipient in the dictator game can therefore be expected to choose closer to $x = 50$ in *T6*.

Indeed, we can establish the following result:

RESULT 2: *The more subjects give in a standard dictator game*, *the more they equalize the ex ante expected value for risky decisions.*

For this, Table 6 panel A reports a series of Tobit regressions that explain the choice in the respective tasks as a function of the choice in the standard dictator game (*T1*).[12] We find that giving in the dictator game is highly informative of giving

differences between treatments are the same as in the conditional giving comparisons. Thus, by excluding zeros from the analysis we are simply concentrating on a pattern that exists more generally in the data.

[12] We use Tobits because of the concentration of giving at zero in all tasks.

in risky situations at the individual level: the coefficient for giving in *T1* is always significant (1 percent level of significance); its sign is positive for *T2*–*T5*, and negative for explaining $|x^{T6} - 50|$ as predicted above. That is, even if the decision does not involve a trade-off of own expected value, agents' choices in the dictator game are informative for the allocation of risks between themselves and some recipient. This is further supported by the fact that when giving in *T1* is higher, then agents also deviate further from their safe option ($x^{T6} = 100$) that secures dictators a payoff of 50 while giving all the risk to the recipient. The last column of Table 6 panel A shows a positive relationship (10 percent significance level) between giving in *T1* and $|x^{T6} - 100|$. We interpret this as further evidence that the generosity in the standard dictator game predicts a tendency toward equating ex ante chances.

In order to confirm that this result is not driven by those who give zero in all tasks (i.e., that the regressions are not simply telling us that selfish dictators in *T1* are selfish in all the other treatments), we also report results from these regressions with an adjusted sample to exclude the selfish players. "Selfish" in Table 6 panel B is defined as people who give zero in *all* tasks *T1* to *T5*. Table 6 panel C gives a further robustness check when excluding only those who give zero in *T1* and the task *Ti* ($i = 1, \ldots, 5$). We find that the relationship between giving in the dictator game and giving in the risky decisions remains (see Table 6 panels B and C).[13] Together, these regressions thereby show that Result 2 is not just driven by the selfish players who always give zero.

While Result 2 showed that giving in the standard dictator game is correlated with agents equalizing the ex ante expected value in other decision tasks, the correlation is not perfect. In fact, we do find evidence that risk faced by the recipient affects the dictators' choices. A series of Wilcoxon signed-rank tests reveals that agents give more in the standard dictator game than in *T2* (5 percent significance) and *T3* (10 percent significance), which is when the recipient's payoff is subject to risk while the dictator's is not. As such, we get the following result:

RESULT 3: *Players' decisions are affected by the recipient's exposure to risk.*

Further insights into this result can be obtained from explicitly comparing the distributions for the decisions (see Table 2). Columns 1 to 3 of Table 7 show that contributions tend to be lower in the tasks involving risk than in the standard dictator game. For this we defined explanatory dummy variables that take value 1 if the task is *T2*, *T3*, *T4*, *T5*, respectively. The result is robust to multiple specifications. In the first specification (columns 1 and 2) we use a hurdle model, regressing the participation indicator on the treatment dummies in the first stage. In the second stage we perform a truncated regression (truncated from below at zero), to adjust the distributional assumption of normality. The truncated regression differs from the GLS

[13] Tobit regressions still make sense when excluding selfish types because there is still 30–42 percent zeros in the various tasks. That is, selfish is defined as giving zero in all tasks. We do not consider those that give zero in at least one task to be selfish, so many zero values remain after removing the "selfish" players from the sample. Table 6 panel C uses a linear regression as all zero values are excluded in each of the regressions. As a further check of the explanatory power of giving in the standard dictator game (*T1*), we regress the decision in *T1*–*T5* on a binary variable that equals 0 if the person was selfish in *T1* and 1 otherwise (Table 6 panel D), again finding evidence for the discussed results.

model in magnitude of the coefficients and in one case in significance of coefficients (*T5* is not significant in the truncated model). Otherwise the truncated regression gives the same pattern of significance and the coefficients have the same signs as the single regression model. While this result is also illustrated in Figure 1, Figures 2 and 3 reveal that this effect is primarily driven by a reduction in the conditional contributions, rather than by a change in the participation rate. In fact, a Wilcoxon test (see Table 5 panel A) shows a difference in conditional contributions between 1 and 2 (1 percent level of significance) and 1 and 3 (1 percent level). We also show significance in the comparison of *T2* versus *T3*, which gives us transitivity with respect to *T1*, *T2*, and *T3* (i.e., $T1 > T2$, $T2 > T3$, $T1 > T3$). This result is consistent with the results in columns 4–6 of Table 7 where we decompose the choice options to distinguish between positive giving, giving between 1 and 49, and giving equal to 50. We find that fewer subjects choose to give 50 in *T2* and *T3* than in the standard dictator game, while more agents give smaller amounts (between 1 and 49).

Note that Result 2 immediately implies that agents' preferences cannot be exclusively based on comparisons of ex ante expected values, as otherwise all tasks should lead to the same choice patterns. One conclusion could be that preferences need to incorporate both ex ante and ex post inequality measures as indicated in (4).

However, the observations that giving in *T2* and *T3* is less than in the standard dictator game is also in line with findings by Dana, Weber, and Kuang (2007): since the potential payoffs to the recipient do not depend on the dictator's choice, the dictator can exploit the "moral wiggle room." Even if the dictator gives one token, the recipient faces the same potential payoffs of 0 (losing the lottery) and 100 (winning the lottery). If the dictator gives zero, the recipient earns zero for certain. But since the recipient may earn zero in any case, the recipient will not be able to perfectly infer the dictator's action from observing the outcome. As such a dictator hiding behind risk may choose to give his partner nothing. Conversely, a dictator may assuage bad feelings by at least giving one token as this makes it possible that the recipient will receive the lottery prize. This may be the reason that giving remains significantly above zero. Thus, while dictators may to some extent use the risk as a chance to hide their greed, as Andreoni and Bernheim (2009) or Klempt and Pull (2010) suggest, this does not completely crowd out giving. As such, it is interesting and puzzling to see that the proportion of players giving zero is also smaller in *T3* than in *T1* (the difference between *T2* and *T1* is insignificant). This indicates that some players who displayed selfish behavior in the standard dictator game give a positive amount in *T3*, thereby giving the recipient a chance to win some large amount.

Our experimental design further allows us to compare the decisions made by dictators with the expectations of the recipient. While recipients' answers were not incentivized, we believe that the comparison of their expectations with the actual choices of the dictators provides interesting insights. Table 4 displays the respective averages, standard deviations, and proportion of subjects expecting $x = 0$ or $x = 50$. Figure 4 shows the averages of choices and expectations for all tasks.

Comparing expectations with actual choices, we see that they almost coincide for the standard dictator game. In the presence of risk, however, expectations generally differ from choices. For *T2* and *T3*, subjects expect more generosity than dictators actually provide (*t*-test at 1 percent significance, Mann-Whitney at 5 percent for *T3*).

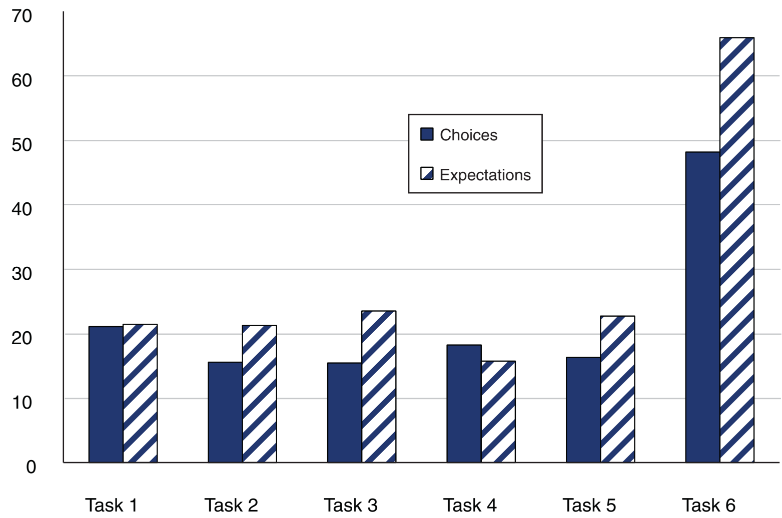


FIGURE 4. CHOICES AND EXPECTATIONS IN THE RESPECTIVE TASKS

Recipients therefore do not expect the dictator's choices to change when only recipients are exposed to risk.

The expectations for *T4*, however, are significantly lower than those in the standard dictator game (1 percent, Wilcoxon). The expectations of recipients are therefore more in line with potential ex post comparisons than actual choices: 58 percent of them expect to get a zero allocation if the dictator allocates lottery tickets which only allow either person to win. They expect a more generous allocation in *T5* when both agents could potentially win (1 percent, Wilcoxon between expectations in *T4* and *T5*). This expectation, however, is not justified by the actual decisions (10 percent significance difference in *T5*, Mann-Whitney).

Finally, in Task *T6* recipients expect a larger exposure to risk, i.e., they anticipate the dictator to choose safer options than these actually do (Mann-Whitney, 1 percent significance). This is in particular driven by recipients not expecting a risk-loving choice ($x = 0$): this extreme choice is taken by 16 percent of dictators, while it was expected by only 3 percent of recipients. We can summarize this discussion as follows:

RESULT 4: *While correctly anticipating decisions in the dictator game, subjects are less able to predict choices when payoffs are risky.*

Result 4 has implications for extensions of the current experimental setup to strategic environments: it may be problematic to find equilibrium strategies when beliefs do not coincide with actual behavior. Similarly, when extending the current dictator game to an ultimatum game context, for example, wrong expectations may affect acceptance decisions if players' preferences depend on expectations (e.g., reference-based models).

## IV. Discussion and Conclusions

Many recent theories attempt to explain behavior in laboratory and field experiments by modeling some sort of social preferences. Giving in dictator, ultimatum, gift exchange, public good, and many other games has been rationalized using preference structures that allow for motivations other than selfishness, such as inequality aversion, concerns for efficiency, or consideration of lowest payoffs. It remained an open question, however, how such "social" behavior extended to situations that involve risk and how the theories can be extended. In our article we provide evidence on these questions by studying how risks may affect the willingness of people to give up consumption in order to benefit others.

In particular, we address the issue of whether social preferences are based on comparisons of final (ex post) payoffs or on comparisons of ex ante chances. By observing decisions in situations that expose the decision maker, another person, or both to risk, we differentiate between these two preference structures. We find that the behavior in a standard dictator game serves as a good predictor for social preferences under risk. Moreover, the behavior of most subjects is inconsistent with dictators comparing exclusively final payoffs. Rather, comparing ex ante chances (in terms of expected value comparisons) has a larger predictive power. However, the risk that recipients face does affect giving by dictators, such that expected value comparisons cannot fully explain our data. As such, we find that a more comprehensive approach that combines ex ante and ex post comparisons may be warranted.

Our study clearly can provide only a first step toward a better understanding of giving decisions under risk that affect other subjects as well as the decision maker. For example, while we fixed the attainable payoff levels in the lottery situations, it appears worthwhile to explore how downside versus upside risk affects behavior or how the availability of insurance options changes transfer decisions. The same holds for possible effects of risk aversion on giving under risk. We leave those questions to future research.

## Appendix A: Experimental Results

Table 1—Summary of Tasks

| Task | Payoff for the dictator (ECU) | Payoff for recipient (ECU) |
|---|---|---|
| *T1* | $100 - x$ | $x$ |
| *T2* | $100 - x$ | 0 or 100, determined by a lottery in which the recipient faces the chances of winning equal to $x/100$ |
| *T3* | $100 - x$ | 0 or 50, determined by a lottery in which the recipient faces the chances of winning equal to $x/50$ |
| *T4* | 0 or 100, determined by a shared lottery with the recipient, in which the dictator faces the chance of winning equal to $1 - x/100$; either the dictator or the recipient wins, not both. | 0 or 100, determined by a shared lottery with the dictator, in which the recipient faces the chance of winning equal to $x/100$, either the dictator or the recipient wins, not both. |
| *T5* | 0 or 100, determined by an independent lottery, in which the dictator faces the chance of winning equal to $1 - x/100$. Draws are independent, i.e. one, or both, or none may win the lottery. | 0 or 100 determined by an independent lottery, in which the recipient faces the chance of winning equal to $x/100$. Draws are independent, i.e. one, or both, or none may win the lottery. |
| *T6* | 50–50 gamble between $x/2$ and $100 - x/2$ determined by an independent lottery | 50–50 gamble between $50 - x/2$ and $50 + x/2$ determined by an independent lottery |

Table 2—Summary Statistics of the Dictator's Choices

| | Number of subjects | Mean of choices | SD of choices | Number of subjects with $x = 0$ | Number of subjects with $x = 50$ | % of subjects with $x = 0$ | % of subjects with $x = 50$ |
|---|---|---|---|---|---|---|---|
| *T1* | 76 | 21.08 | 27.45 | 38 | 17 | 50 | 22 |
| *T2* | 76 | 15.57 | 20.13 | 37 | 9 | 49 | 12 |
| *T3* | 76 | 15.44 | 17.67 | 30 | 9 | 39 | 12 |
| *T4* | 76 | 18.24 | 27.12 | 43 | 12 | 57 | 16 |
| *T5* | 76 | 16.30 | 21.74 | 41 | 12 | 54 | 16 |
| *T6* | 76 | 48.16 | 33.59 | 12 | 17 | 16 | 22 |

Table 3—Summary Statistics of the Recipient's Expectations

| | Number of subjects | Mean of choices | SD of choices | Number of subjects with $x = 0$ | Number of subjects with $x = 50$ | % of subjects with $x = 0$ | % of subjects with $x = 50$ |
|---|---|---|---|---|---|---|---|
| *T1* | 76 | 21.43 | 23.80 | 32 | 18 | 42 | 24 |
| *T2* | 76 | 21.25 | 26.77 | 32 | 11 | 42 | 14 |
| *T3* | 76 | 23.51 | 20.74 | 20 | 17 | 26 | 22 |
| *T4* | 76 | 15.74 | 23.01 | 44 | 10 | 58 | 13 |
| *T5* | 76 | 22.72 | 23.06 | 29 | 17 | 38 | 22 |
| *T6* | 76 | 65.91 | 28.91 | 2 | 26 | 3 | 34 |

Table 4—Summary Statistics of Conditional Giving, by Task

| | Number of subjects | Mean of choices | SD of choices | % of subjects with $x = 50$ | % of subjects with $0 < x < 50$ |
|---|---|---|---|---|---|
| *T1* | 38 | 42.16 | 24.79 | 45 | 45 |
| *T2* | 39 | 30.33 | 18.44 | 23 | 72 |
| *T3* | 46 | 25.52 | 16.06 | 20 | 80 |
| *T4* | 33 | 42.00 | 26.36 | 36 | 45 |
| *T5* | 35 | 35.40 | 18.62 | 34 | 57 |
| *T6* | 64 | 57.19 | 28.62 | 27 | 34 |

*Note:* All subjects who give positive amounts in Tasks 1–5 also give positive amounts in Task 6.

Table 5

| Task | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| *Panel A. Differences in average tokens given, conditional on giving* | | | | |
| 1 | 12.55*** | 14.94*** | 0.39 | 8.04 |
| | (31) | (35) | (26) | (30) |
| 2 | | 6.34** | −7.27 | −5.22** |
| | | (32) | (26) | (27) |
| 3 | | | −16.76*** | −10.10*** |
| | | | (29) | (32) |
| 4 | | | | 3.63 |
| | | | | (27) |
| *Panel B. Differences in average tokens given, unconditional* ($N = 76$) | | | | |
| 1 | 5.51** | 5.63* | 2.84 | 4.78 |
| 2 | | 0.12 | −2.67 | −0.74 |
| 3 | | | −2.79 | −0.86 |
| 4 | | | | 1.93 |

*Notes:* Sample size for each comparison in parentheses. Differences tested with Wilcoxon signed-rank tests.
***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 6

| | Dependent variable | | | | | |
|---|---|---|---|---|---|---|
| | Tokens given in *T2* | Tokens given in *T3* | Tokens given in *T4* | Tokens given in *T5* | \|*T6*–50\| | \|*T6*–100\| |
| *Panel A. Tobit regression of choices in tasks on dictator game decisions, with robust standard errors (clustering at the individual level), full dataset* | | | | | | |
| Tokens given in *T1* | 0.71*** | 0.47*** | 0.85*** | 0.87*** | –0.30*** | 0.26* |
| | (0.14) | (0.12) | (0.23) | (0.15) | (0.12) | (0.14) |
| Constant | –11.04** | –1.68 | –23.73*** | –17.87*** | 30.16*** | 42.74*** |
| | (4.86) | (3.98) | (8.96) | (6.23) | (3.78) | (7.21) |
| Pseudo $R^2$ | 0.07 | 0.04 | 0.04 | 0.08 | 0.01 | 0.004 |
| *F* statistic | 27.57*** | 16.16*** | 14.05*** | 34.47*** | 6.50*** | 3.32* |
| *Panel B. Tobit regression of choices in tasks on dictator game decisions, with robust standard errors (clustering at the individual level), conditional on giving in at least one task out of Task 1 to Task 5* | | | | | | |
| Tokens given in *T1* | 0.46*** | 0.21** | 0.43** | 0.60*** | –0.25** | 0.53*** |
| | (0.11) | (0.09) | (0.21) | (0.14) | (0.12) | (0.17) |
| Constant | 3.38 | 13.57*** | 0.72 | –2.40 | 26.99*** | 27.56*** |
| | (5.05) | (3.86) | (9.20) | (6.27) | (4.92) | (7.02) |
| Pseudo $R^2$ | 0.04 | 0.01 | 0.01 | 0.04 | 0.01 | 0.02 |
| *F* statistic | 9.80*** | 3.22* | 3.39*** | 16.82*** | 3.13* | 9.76*** |
| *Panel C. Linear regression of choices in tasks on dictator game decisions, with robust standard errors (clustering at the individual level), conditional on Task 1 > 0 and Task i > 0* | | | | | | |
| Tokens given in *T1* | 0.45*** | 0.25* | 0.67*** | 0.20 | | |
| | (0.16) | (0.13) | (0.17) | (0.18) | | |
| Constant | 11.39* | 15.93*** | 13.41*** | 27.89*** | | |
| | (5.51) | (5.01) | (6.70) | (7.80) | | |
| Pseudo $R^2$ | 0.35 | 0.02 | 0.39 | 0.08 | | |
| *F* statistic | 8.19*** | 3.73* | 15.92*** | 1.37 | | |
| *Panel D. (Selfish binary) Tobit regression of choices in tasks on dictator game decisions, with robust standard errors (clustering at the individual level)* | | | | | | |
| Nonselfish | 41.33*** | 30.96*** | 53.47*** | 55.88** | | |
| | (7.58) | (5.68) | (12.47) | (8.37) | | |
| Constant | –18.67 | 17.25*** | –35.19*** | –29.99*** | | |
| | (6.80) | (5.51) | (11.56) | (8.25) | | |
| Pseudo $R^2$ | 0.07 | 0.06 | 0.04 | 0.10 | | |
| *F* statistic | 24.77*** | 22.65*** | 11.68*** | 42.19*** | | |

*Notes:* We report McFadden's pseudo $R^2$ statistics and $F$ statistics for joint significance. The results reported in panel C are robust to adjusting for a truncated normal error distribution. Standard errors in parentheses.

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 7

| | Probit participate (choice >0) | Truncated linear regression choice | Linear random effects model, GLS robust SE's choice | Probit participate (choice > 0) | Probit choice in [1, 49] | Probit choice = 50 |
|---|---|---|---|---|---|---|
| *T2* | 0.07 | −17.51** | −5.51** | 0.07 | 0.66** | −0.65** |
| | (0.28) | (7.34) | (2.55) | (0.28) | (0.27) | (0.32) |
| *T3* | 0.57** | −26.67*** | −5.63** | 0.57** | 1.13*** | −0.65* |
| | (0.29) | (7.60) | (2.84) | (0.29) | (0.28) | (0.32) |
| *T4* | −0.34 | −0.20 | −2.84 | −0.34 | −0.12 | −0.39 |
| | (0.29) | (6.98) | (3.36) | (0.29) | (0.28) | (0.31) |
| *T5* | −0.21 | −9.37 | −4.78* | −0.21 | 0.21 | −0.37 |
| | (0.29) | (7.17) | (2.52) | (0.29) | (0.27) | (0.30) |
| Constant | −0.02 | 38.57*** | 21.07*** | −0.02 | −1.19*** | −1.24*** |
| | (0.30) | (4.95) | (3.17) | (0.30) | (0.26) | (0.29) |
| Wald statistic | 9.42** | 17.99*** | 6.75 | 9.42** | 27.03*** | 5.00 |

*Notes:* Hurdle model (columns 1–2), maximum likelihood estimates in random effects regression (column 3) or probit models (columns 4–6) on dictators' choices for the different tasks (baseline is dictator game *T1*). Standard errors in parentheses. We report Wald statistics for joint significance of the covariates given a $\chi^2$ distribution with four degrees of freedom.

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

## Appendix B: Fehr-Schmidt Preferences Based on ex ante or ex post Preferences

In order to illustrate the consequences of preferences that incorporate ex ante and ex post comparisons, we combine the Fehr-Schmidt (1999) preference structure as given in (1) with the linear combination of ex ante and ex post extensions as stated in (5).

**Treatment 1:** For the standard dictator game (*T1*), there is no risk such that the utility measure for $x \leq 50$ is given by

$$W(x) = 100 - x - \beta(100 - 2x)$$

such that we obtain the well-known result from Fehr and Schmidt (1999) (note that no dictator would choose $x > 50$)

$$x^{T1}\begin{cases} = 0 & \beta < 0.5 \\ \in [0, 50] \quad \text{if} & \beta = 0.5 \\ = 50 & \beta > 0.5, \end{cases}$$

The weight on the ex post comparisons is $\gamma \in [0, 1]$.

**Treatment 2:** The ex ante expected values are again given by $E(c^1) = 100 - x$ and $E(c^2) = x$. Therefore, for $x > 50$,

$$W(x) = 100 - x - (1-\gamma)\alpha(2x - 100) - \gamma\alpha\frac{x}{100}x - \gamma\beta\frac{100-x}{100}(100-x)$$

such that differentiation leads to

$$-1 - 2(1-\gamma)\alpha \underbrace{- 2\gamma\alpha\frac{x}{100} + 2\gamma\beta\frac{100-x}{100}}_{<\,0} < 0,$$

which implies that $x \leq 50$. In this case, we obtain

$$W(x) = 100 - x - (1-\gamma)\beta(100 - 2x) - \gamma\alpha\frac{x}{100}x - \gamma\beta\frac{100-x}{100}(100-x)$$

such that differentiation leads to

$$-1 + 2(1-\gamma)\beta - 2\gamma\alpha\frac{x}{100} + 2\gamma\beta\frac{100-x}{100} \leq 0,$$

or—equivalently—

$$x^{T2} = \min\left[50\frac{\max[0, 2\beta - 1])}{(\alpha+\beta)\gamma}, 50\right].$$

As in the standard dictator game, agents give only if $\beta > 0.5$. However, they may give less than in the standard dictator if they put sufficient weight $\gamma$ on ex post comparisons. To see this note that $50(\max[0, 2\beta - 1])/(\alpha + \beta) < 50$. We would thus predict a similar number of players giving in Treatment 2 and Treatment 1 if agents' preferences are based on ex post comparisons, but with smaller giving amounts in Treatment 2. Note that increases in the weight $\gamma$ put on ex post comparisons would decrease giving.

**Treatment 3:** Here the utility for player 1 (when giving $x \leq 50$) is given by

$$W(x) = 100 - x - (1-\gamma)\beta(100 - 2x) - \beta\gamma\frac{x}{50}(100 - x - 50) - \beta\gamma\frac{100-2x}{100}(100-x).$$

The derivative with respect to $x$ is given by $W'(x) = -1 + 2\beta$ such that the same decisions as in the standard dictator game are predicted. Intuitively, the payoffs can be equalized for sure if the agent chooses $x = 50$. The optimal choice is therefore driven by beta, as in Treatment 1.

**Treatment 4:** Here the utility for player 1 (when giving $x \leq 50$) is given by

$$W(x) = (1-\gamma)(100-x) - (1-\gamma)\beta(100-2x)$$

$$+ \gamma\frac{100-x}{100}(100-\beta 100) + \gamma\frac{x}{100}(-\alpha 100)$$

such that

$$W'(x) = -(1-\gamma) + 2(1-\gamma)\beta - \gamma(1-\beta) - \gamma\alpha$$

$$= -1 + (2-\gamma)\beta - \gamma\alpha.$$

This implies that agents give only if $\beta \geq (1+\gamma\alpha)/(2-\gamma)$. If they do, then they are predicted to give $x = 50$. Note that if $\gamma = 0$ the same subjects are predicted to give as under *T1*. If, however, the weight on ex post preferences gets larger, the range of inequality parameters that lead to positive giving shrinks.

**Treatment 5:** Here the expected utility for player 1 is given by

$$W(x) = (1-\gamma)(100-x) - (1-\gamma)\beta(100-2x)$$

$$+ \gamma\left(\frac{100-x}{100}\right)^2(100-\beta 100)$$

$$+ \gamma\left(\frac{100-x}{100}\right)\left(\frac{x}{100}\right)(100)$$

$$+ \gamma\left(\frac{x}{100}\right)^2(-\alpha 100).$$

The derivative with respect to $x$ is given by

$$W'(x) = -(1-\gamma)(1-2\beta) - 2\gamma\left(\frac{100-x}{100}\right)(1-\beta) + \gamma\frac{100-2x}{100} - 2\gamma\frac{x}{100}\alpha$$

such that

$$x^{T5} = \min\left[50\frac{\max[0, 2\beta-1])}{(\alpha+\beta)\gamma}, 50\right].$$

Note that this prediction coincides with the prediction in *T2*.

**Treatment 6:** The utility for player 1 if $x < 50$ is given by

$$(1-\gamma)\frac{1}{2} + \frac{\gamma}{2}\left(\frac{x}{2} - \frac{\alpha}{2}\left(\left(50 - \frac{x}{2} - \frac{x}{2}\right) + \left(50 + \frac{x}{2} - \frac{x}{2}\right)\right)\right)$$

$$+ \frac{\gamma}{2}\left(100 - \frac{x}{2} - \frac{\beta}{2}\left(\left(100 - \frac{x}{2} - \left(50 - \frac{x}{2}\right)\right) + \left(100 - \frac{x}{2} - \left(50 + \frac{x}{2}\right)\right)\right)\right)$$

$$= (1-\gamma)\frac{1}{2} + \frac{\gamma}{2}\left(\frac{x}{2} - \frac{\alpha}{2}(100 - x)\right) + \frac{\gamma}{2}\left(100 - \frac{x}{2} - \frac{\beta}{2}(100 - x)\right)$$

$$= (1-\gamma)\frac{1}{2} + \frac{\gamma}{2}\left(100 - \frac{\alpha + \beta}{2}(100 - x)\right).$$

For the case of $x > 50$, expected utility is given by

$$(1-\gamma)\frac{1}{2} + \frac{\gamma}{2}\left(\frac{x}{2} - \frac{\alpha}{2}\left(\left(50 + \frac{x}{2} - \frac{x}{2}\right) - \frac{\beta}{2}\left(\frac{x}{2} - \left(50 - \frac{x}{2}\right)\right)\right)\right)$$

$$+ \frac{\gamma}{2}\left(100 - \frac{x}{2} - \frac{\beta}{2}\left(100 - \frac{x}{2} - \left(50 - \frac{x}{2}\right)\right) - \frac{\alpha}{2}\left(\left(50 + \frac{x}{2}\right) - \left(100 - \frac{x}{2}\right)\right)\right)$$

$$= (1-\gamma)\frac{1}{2} + \frac{\gamma}{2}\left(\frac{x}{2} - \frac{\alpha}{2}50 + \frac{\beta}{2}(50 - x)\right) + \frac{\gamma}{2}\left(100 - \frac{x}{2} - \frac{\beta}{2}50 + \frac{\alpha}{2}(50 - x)\right)$$
$$= (1-\gamma)\frac{1}{2} + \frac{\gamma}{2}\left(100 - \frac{\alpha + \beta}{2}x\right).$$

That is, expected utility is increasing for $x < 50$ but decreasing for $x > 50$ such that any inequality-averse player would be predicted to choose $x = 50$.

We can summarize the predictions as follows:

- Contributions in *T1* equal those in *T3*; if they give, they give 50.
- Contributions in *T2* equal those in *T5* and are smaller than those in *T1*/*T3*, while participation is predicted to be the same as in *T1*/*T3*.
- Fewer agents give in *T4* than in *T1*/*T3* if they are putting weight on ex post comparisons. If they give, they still give 50.
- Inequality-averse agents in *T6* equalize ex ante chance by choosing $x = 50$.

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