Other-Regarding Preferences and Giving Decision in a Risky Environment: Experimental Evidence*

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Abstract

We investigate whether and how an individual giving decision is affected in risky environments in which the recipient's wealth is random. We demonstrate that, under risk neutrality, the donation of dictators with a purely *ex post* view of fairness should, in general, be affected by the riskiness of the recipient's payoff, while dictators with a purely *ex ante* view should not be. Furthermore, we observe that some influential inequality aversion preferences functions yield opposite predictions when we consider *ex post* view of fairness. Hence, we report on dictator games laboratory experiments in which the recipient's wealth is exposed to an actuarially neutral and additive background risk. Our experimental data show no statistically significant impact of the recipient's risk exposure on dictators' giving decisions. This result appears robust to both the experimental design (within subjects or between subjects) and the origin of the recipient's risk exposure (chosen by the recipient or imposed on the recipient). Although we cannot sharply validate or invalidate alternative fairness theories, the whole pattern of our experimental data can be simply explained by assuming *ex ante* view of fairness and risk neutrality.

JEL codes: C91, D64, D81

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1 Introduction

In many situations, the decision to give is made under uncertainty about the recipient. In particular, depending on various factors such as asymmetric information and transaction costs, it may be difficult or costly for donors to perfectly observe the actual wealth conditions of the recipient. For instance, when giving to a charity, donors do not know exactly if their money will be spent for those truly in need. Or a beggar in the street may otherwise have family support or public help. Said differently, donors may not be sure that the recipient truly deserves their donations. However, this uncertainty may affect donors' decisions. In one experiment, Eckel and Grossman [1996] observed that student subjects are more generous when they know their gift benefits an established charity rather than another anonymous student subject. However, in a recent study, Engel and Goerg [2018] found that experimental dictators tend to spend significantly more if recipients' endowments are uncertain because they want to rule out the extreme case of a recipient with no endowment at all. Furthermore, the uncertainty may be about the reason explaining the initial situation of the recipient. Fong and Oberholzer-Gee [2011] showed that people would be ready to devote resources to learn about the recipients of their gifts. They found that a third of student subjects are willing to sacrifice resources to know if the recipient is a disabled or a drug user, suggesting that the nature and the origin of the recipient's wealth conditions matter for many donors.

In this paper, we use dictator game laboratory experiments *à la* Kahneman et al. [1986] to investigate whether and how individual giving decision-making is affected in a risky environment in which the recipient's wealth is random. In the standard dictator game laboratory experiment, one anonymous subject − called the dictator − makes a one-shot division of an endowment (provided by some anonymous experimenters) between himself/herself and an another anonymous subject − called the recipient − who has to accept the division. The only modification that we brought to this design is that we give an endowment to both the recipient and the dictator (while keeping an additional endowment to be divided by the dictator), and we carefully manipulate the riskiness and the nature of the recipient's endowment as a treatment variable. In addition, we also test whether the riskiness of the recipient's endowment differentially affects the dictator's behavior when it is the result of the recipient's choice. There is evidence that information about the source of the recipient's condition affects the decision to give. In the lab and the field, it has been shown that donors are more generous if they feel that the needy is not responsible for their predicament [Eckel and Grossman, 1996; Fong and Oberholzer-Gee, 2011].

In all our treatments, the dictator has a riskless monetary endowment of €5 and, in addition, has to divide €10 between him/her and the recipient. In our first benchmark treatment (*T1* hereafter), the recipient has a riskless endowment of €5. In our second treatment (*T2* hereafter), the recipient has a risky endowment taking either value €0 or value €10 with equal probability. Compared with *T1*, the recipient in *T2* has to bear an additive and actuarially neutral background risk affecting his/her experimental monetary payoff. The presence of this exogenous risk implies that the recipient's initial endowment is either greater (€10 $>$€5) or smaller (€0 $<$ €5) than that of the dictator. This contrasts with the risk-free situation in *T1* in which both the recipient and the dictator were endowed with €5 for sure. In a third treatment (*T3* hereafter), the recipient has the possibility to choose between the riskless endowment of €5 and the risky endowment taking either value €10 or value €0 with equal probability. Put differently, the recipient has to select between a riskless payoff or a risky payoff with equal mean. Thus, the mean monetary payoff of the recipient is kept constant (equal to €5), and the information regarding the recipient's payoff is common knowledge in each treatment.

These treatments allow us to study how the donation is affected when the recipient's initial situation is uncertain. In particular, the dictator knows if the recipient's endowment is either riskless (as in *T1*) or risky (as in *T2*) and if this wealth condition is due to the choice of the recipient (as in *T3*) or to the choice of the experimenter (as in *T1* and *T2*). The comparison of *T1* with *T2* allows us to observe the impact of the recipient's risk exposure on dictators' giving decision. The comparison of *T3* with *T1* and *T2* yields observations of the impact of the origin of the recipient's risk exposure on dictators' giving decision. Furthermore, the treatments allow us to disentangle between *ex ante* (procedural) and *ex post* (consequential) views of fairness. Indeed, because the expected value of the recipient's payoff is kept constant in all our treatments, risk neutral dictators with a purely *ex ante* view of fairness should not be affected by the background risk, and no treatment effect should be observed. On the other hand, treatment effects should, in general, be observed for dictators with *ex post* concerns. Intuitively, the reason is that the presence of the background risk makes it impossible for dictators exhibiting *ex post* inequality aversion to equalize final payoffs or at least to achieve their preferred difference in final payoffs. Indeed, when considering the possibility of *ex post* concerns, we observe that some influential inequality aversion theories, Fehr and Schmidt [1999] and Bolton and Ockenfels [2000], have opposite predictions: The introduction of the background risk decreases the optimal donation of dictators exhibiting a difference form of inequality aversion *à la* Fehr and Schmidt [1999], whereas it increases the number of dictators exhibiting a ratio form of inequality aversion *à la* Bolton and Ockenfels [2000].

This paper is not only related to the literature on the effect of different endowment in dictator games, but also it is related to some recent studies on giving in the presence of risk. Korenok et al. [2012] have shown that the inequality in the distribution of endowments is a key determinant of the dictator's transfer, which typically decreases as the recipient's endowment increases and becomes closer to that of the dictator. Chowdhury and Jeon [2014] have also pointed out the existence of a pure income effect such that when both endowments increases, the dictator's transfer increases monotonically. Bolton and Ockenfels [2010] have investigated the trade-off between a safe option and a risky option when the choice also affects the payoff of another anonymous subject. They found that the safe option is chosen less frequently when it yields unfavorable inequality and that *ex post* inequalities that may result from the choice of the risky option having no impact. Cappelen et al. [2013] showed that the origin of inequalities (either from luck or choice) matters for many subjects who agreed to eliminate inequalities resulting from differences in luck within pairs of risk-takers, but disagreed to eliminate those resulting from differences in choices.

In addition, many papers have studied social preferences when risky outcomes are possible. Fudenberg and Levine [2012] proposed a two-agent model, in which each state realizes with equal probability. They pointed out that the independence axiom is incompatible with *ex ante* fairness. Saito [2013] extended the Fehr and Schmidt model of other-regarding preferences and allows for an *ex ante* and an *ex post* view of fairness in the presence of outcome risk. His framework allows consideration of both motives in the same utility function but does not conclude on the prominence of one or another. Though the interpretation of fairness intentions plays an important role in understanding subjects' decisions; and this besides distributional preferences on the fairness of outcomes [Falk et al., 2008].

Other papers interested in individual views of fairness in risky environments have also used dictator game laboratory experiments. In these experiments, the background risk affects the amount of the dictator's transfer to the recipient. Krawczyk and Lec [2010] looked at situations where the dictator had an option to share chances to win a prize with the recipient and where both the dictator and the recipient eitherface riskless payoffs or face risky payoffs. In the latter case, they also introduced "competitive" conditions where the dictator allocates mutually exclusive chances to win a prize (i.e., one's success implies the other's failure) and "noncompetitive" conditions where he/she allocates independent ones. They observed a significant fraction of subjects sharing chances to win in the competitive, risky treatment but sharing less than in the noncompetitive, risky treatment. These results suggest that models featuring a purely *ex post* or a purely *ex ante* view of fairness cannot explain the data. Brock et al. [2013] have also shown that both *ex ante* and *ex post* fairness considerations explain decisions to give, which finally ends in a reduction of transfers in risky environments. Cappelen et al. [2013] show that when the choice of the dictator may create inequality, they tend to favour *ex post* redistribution. More recently, Cettolin et al. [2017] have introduced some actuarially neutral risk affecting the dictator's transfer in a multiplicative way. They propose an extension of Saito's model with nonlinearity in earnings. They show that the presence of risk tends to decrease giving and that the dictators' risk preferences are important determinants of their generosity under risk. Apart from fairness considerations, the dictator's degree of risk aversion appears to be significantly and positively related to the amount transferred to the recipient.

In contrast to the existing literature, we study cases where the risk is an additive background risk, which is an exogenous risk affecting the recipient's payoff in an additive way and remaining out of the control of the dictator. The effectiveness of the dictator's transfer is known, and its amount is certain, but the recipient's final wealth may be risky. Close to our study, Engel and Goerg [2018] examined different specifications of randomness regarding the recipient's endowment, and they found that dictators tend to transfer more if the recipient's endowment is completely unknown. Our risky treatment *T2* is similar to their "symmetry" treatment except that the dictator total endowment is €10.[1] They find a significant positive effect of the background risk on the donation in this treatment, although this is the treatment where they observe the weakest effect.

Our experimental data show no statistically significant impact of the recipient's risk exposure on dictators' giving decisions. This result appears robust to both the experimental design (within subjects or between subjects) and the origin of the recipient's risk exposure (chosen by the recipient or imposed to the recipient). Although we cannot sharply validate or invalidate alternative fairness theories, the whole pattern of our experimental data can be simply explained by assuming *ex ante* view of fairness and risk neutrality. Furthermore, as in Cettolin et al. [2017], we find a significant and positive correlation between dictators' risk tolerance and willingness to give.

The remainder of the paper is structured as follows. Section 2 presents our theoretical predictions. Section 3 describes the experimental procedure and results. Section 4 concludes.

2 Theory and hypotheses

The theoretical predictions regarding the dictator's optimal donation and how it would be affected by our treatment effects depend on the assumptions made about his/her preferences. The optimal donation of a self-interested dictator is zero regardless of the recipient's endowment. Therefore, all dictators with self-interested preferences would give zero in all our treatments.[2]

In contrast, dictators with other-regarding preferences may well donate positive amounts and be

[1] Precisely, in Engel and Goerg [2018]'s "baseline" risk-free treatment, the dictator is endowed with €10 (against €15 in *T1*) and the recipient is endowed with €5 (as in *T1*). In their "symmetry" risky treatment, the dictator is endowed with €10 (against €15 in *T2*), and the recipient has a risky endowment taking either value €0 or value €10 with equal probability (as in *T2*).

[2] Dictators with spiteful preferences would, of course, also give zero in all our treatments.

sensible to our treatment effects by reacting to the riskiness of the payoff of the recipient. However, we show in this section that the optimal donation of dictators depends on the view of fairness, either *ex ante* or *ex post* and on the other-regarding preferences framework adopted. In the following, we compare two major forms of inequality aversion. Predictions are made using the parameters of our experiment presented in the introduction.

In the sequel, we consider that the dictator has other-regarding preferences with utility function

$$w_1(g) = w\left(d\left(g\right), r(g)\right) \tag{1}$$

where g is the dictator's gift, $d\left(g\right) = 15 - g$ is the dictator's monetary payoff, and $r\left(g\right) = 5 + g$ is the recipient's monetary payoff.

2.1 *Ex ante* view of fairness

Let us first consider that the dictator values *ex ante* wealth comparisons only. If the dictator is risk neutral, that is, if the dictator evaluates the recipient's risky wealth in a risk-neutral way, then his/her behavior would obviously not be affected by the presence of the actuarially neutral background risk. This is true because any fairness preferences function of the form $w\left(d\left(g\right), r(g)\right)$ is equivalent to $w\left(d\left(g\right), E\widetilde{r}(g)\right)$ whenever $E\widetilde{r}(g) = r(g)$. Clearly, this result holds independently of the particular other-regarding preferences function considered. This results in Proposition 1.

Proposition 1 *If the dictator exhibits ex ante inequality aversion and is risk neutral, then the actuarially neutral background risk affecting the recipient's wealth has no impact on the optimal donation of the dictator.*

The above result is obvious, as we assume risk neutrality of the dictator and the background risk is actuarially neutral. When we consider a dictator is risk-averse or risk-seeker, the prediction under *ex ante* fairness may be different. In this framework, risk neutrality can be relaxed by assuming expected utility preferences over the recipient's random wealth. The dictator's preferences function with background risk is written

$$w_2(g) = w\left(d\left(g\right), r(g) - \pi\left(g\right)\right) \tag{2}$$

The dictator's fairness preferences aggregate his/her wealth $d\left(g\right)$ and the certainty equivalent of the recipient's risky wealth, which is equal to the difference between the expected value of the recipient's wealth $E\widetilde{r}(g) = r(g)$ and the risk premium $\pi\left(g\right)$. Under expected utility, the risk premium is a complex function of risk preferences captured by a Bernoulli utility function, the distribution of the background risk and the amount of donation. The risk premium could be computed as follows:

$$\pi(g) = r(g) - u^{-1}\left(Eu\left(\widetilde{r}(g)\right)\right) \tag{3}$$

where u is Bernoulli's utility function capturing risk preferences.[3] To simplify the analysis, we assume constant absolute risk aversion so that the risk premium is independent of the donation (i.e., $\pi(g) = \pi$). As is well-known, under risk aversion Bernoulli's utility function is concave, and the risk premium is positive. Therefore, if the dictator exhibits an *ex ante* view of fairness and risk aversion, then the impact of background risk is equivalent to the impact of a certain loss to the recipient equal to the risk premium. Thus, we obtain that, under constant absolute risk aversion, the background risk *increases* the dictator's optimal donation assuming either Fehr and Schmidt [1999] or Bolton and Ockenfels [2000] fairness preferences function. The reverse result obviously holds under risk seeking.[4]

Proposition 2 *If the dictator exhibits ex ante inequality aversion à la Fehr and Schmidt [1999] or Bolton and Ockenfels [2000], and constant absolute risk aversion (resp. risk seeking), then the actuarially neutral background risk affecting the recipient's wealth increases (resp. decreases) the optimal donation of the dictator.*

2.2 *Ex post* view of fairness

We now consider that the dictator values *ex post* wealth comparisons only. In this case, the outcome may depend on the specific form of the utility function. In what follows, we show that difference form inequality aversion à la Fehr and Schmidt [1999] and ratio form inequality aversion à la Bolton and Ockenfels [2000] yield opposite predictions regarding the impact of the background risk.

2.2.1 Difference form inequality aversion

Suppose that the dictator behaves according to a piecewise linear preferences function exhibiting a difference form of inequality aversion *à la* Fehr and Schmidt [1999]. Then the dictator's prefer-

[3]The certainty equivalent of $\widetilde{r}(g)$ is $u^{-1}\left(Eu\left(\widetilde{r}(g)\right)\right)$.

[4]The proof is given in the appendix.

ences function is written:

$$\begin{aligned} u_1(g) &= u(d(g), r(g)) \\ &= d(g) - \alpha \max\{r(g) - d(g), 0\} - \beta \max\{d(g) - r(g), 0\} \end{aligned} \tag{4}$$

where $\alpha \geq 0$ and $\beta \geq 0$ are preferences parameters measuring the intensity of the loss of the dictator from disadvantageous and advantageous inequality. Fehr and Schmidt [1999] assumed $\alpha \geq \beta$, i.e. disadvantageous inequality is more harmful than advantageous inequality. As they put it, subjects are loss-averse in social comparisons.

Now suppose that the recipient's endowment is risky. Then, the dictator's expected preferences function is written:

$$\begin{aligned} u_2(g) &= Eu(d(g), \widetilde{r}(g)) \\ &= d(g) - \alpha E \max\{\widetilde{r}(g) - d(g), 0\} - \beta E \max\{d(g) - \widetilde{r}(g), 0\} \end{aligned} \tag{5}$$

where $\widetilde{r}(g) = \left(10 + g, \frac{1}{2}; g, \frac{1}{2}\right)$ is a binary random variable taking value $10 + g$ and value g with equal probability. Thus, the presence of the background risk implies that the recipient's endowment is either greater (€$10 >$ €5) or smaller (€$0 <$ €5) than the one of the dictator. This contrasts with the previous situation in which both the recipient and the dictator were endowed with €5 for sure. Proposition 3 shows that the risk exposure of the recipient *decreases* the optimal donation of dictators exhibiting some *ex post* difference form of inequality aversion.[5]

Proposition 3 *If the dictator exhibits a difference form of ex post inequality aversion à la Fehr and Schmidt [1999], then the actuarially neutral background risk affecting the recipient's wealth decreases the optimal donation of the dictator.*

2.2.2 Ratio form inequality aversion

Let us now suppose that the dictator behaves according to a ratio form preferences function exhibiting inequality aversion *à la* Bolton and Ockenfels [2000]:

$$v_1(g) = v(d(g), r(g)) = ad(g) - \frac{1}{2}b\left[\frac{d(g)}{d(g) + r(g)} - \frac{1}{2}\right]^2 \tag{6}$$

[5] The proof is given in appendix.

where $a \geq 0$ and $b > 0$ are motivation parameters measuring the weights that the dictator attributes to his/her own payoff and relative payoff, respectively. Again, suppose that the recipient's endowment is risky. Then the expected dictator's preferences function is written

$$v_2(g) = Ev(d(g), \widetilde{r}(g)) = ad(g) - \frac{1}{2}bE\left[\frac{d(g)}{d(g)+\widetilde{r}(g)} - \frac{1}{2}\right]^2 \qquad (7)$$

Proposition 4 shows that the risk exposure of the recipient *increases* the optimal donation of dictators exhibiting some *ex post* ratio form of inequality aversion.[6]

Proposition 4 *If the dictator exhibits a ratio form of ex post inequality aversion à la Bolton and Ockenfels [2000], then the actuarially neutral background risk affecting the recipient's wealth increases the optimal donation of the dictator.*

3 Experimental procedures and results

Our experiments consist of a one-shot standard dictator game, as presented in the introduction of this paper. In a first step, we use a between-subjects design, but as will be exposed below, we rely on a within-subject design as a robustness test of our results.[7]

3.1 Procedures

The difference between the treatments concerns the potential riskiness of the recipient's endowment, although its expected value remains constant among treatments. In the riskless treatment $T1$, the dictator knows that the recipient's endowment is €5. In the risky treatment $T2$, the dictator knows that the recipient's endowment is either €0 or €10 with equal probability. Recall that in treatment $T3$ the recipient has to choose between a certain endowment (a case in which we call $T3_c$ hereafter) or a risky endowment (a case that we call $T3_r$ hereafter). This is common knowledge. Therefore, in treatment $T3$, before making his/her decision, the dictator knows the choice of endowment made by the recipient.

In addition to the dictator game, we elicited participants' risk attitude using a portfolio choice task in which the investor has to allocate some wealth between a safe and a risky asset (Gneezy and Potters, 1997; Beaud and Willinger, 2015). Subjects received €10 available for the portfolio task. The safe asset has a riskless rate of return of 1 (the amount invested in the safe asset is simply

[6]The proof is given in the appendix.
[7]The instructions of both designs are presented in the appendix.

secured), while the risky asset has a risky rate of return taking either value 0 (the amount invested in the risky asset is lost) or value 3 (the amount invested in the risky asset is tripled) with equal probability. Observe that the expected rate of return of the risky asset is strictly larger than that of the safe asset (i.e., $1.5 > 1$). In this context, it is known that any expected utility maximizer and risk-averse subject (with monotonic preferences) should invest a strictly positive amount in the risky asset, and this amount should be greater for less risk-averse subjects. Additionally, a risk-neutral or risk-seeking subject should invest the entire endowment of €10 in the risky asset.

We have also elicited dictators' beliefs about recipients' risk preferences by asking them to estimate the investment choice made by the other group member. Since incentivizing beliefs increases belief accuracy [GÃd'chter and Renner, 2010; Palfrey and Wang, 2009]. This task is elicited in offering a €5 prize if they rightly evaluate the other's portfolio choice. To keep this part as a simple add-on of the individual payoff function, we decided to offer a simple incentive mechanism for eliciting beliefs. At the end of the experiment, we recorded individual demographic characteristics , and one of the two main tasks (dictator game or risk elicitation) was randomly drawn for payment.[8]

Our experiments were conducted at the Laboratoire d'Economie Expérimentale de Strasbourg (LEES hereafter) of the University of Strasbourg. All decisions were made anonymously without the possibility for the participants to communicate. Neither the dictator nor the recipient knew the participant's identity with whom they were matched. In total, 358 students took part in 16 sessions, which corresponds to 179 dictator-recipient pairs. There were 57 dictator-recipient pairs in the 4 sessions of *T1* (42% of whom were female), 57 dictator-recipient pairs in the 5 sessions of *T2* (53% of whom were female) and 65 in the 6 sessions of *T3* (47% of whom were female). Average earnings were €13.4 with standard deviation €4.9. A session lasted on average 25 minutes.

3.2 Results

Summary statistics on the dictators' choices are reported in Table 1 for each treatment. The table provides the average transfer (and standard deviation) as well as the proportion of dictators choosing the equal split (i.e., $g = 5$) and that of those who give nothing (i.e., $g = 0$). In our riskless benchmark treatment *T1*, the average transfer is €2.23 and the proportion of dictators who give nothing is 35%. The proportion of those who choose the equal split is 18%. These observations

[8]Random incentives have sometimes been noted for undermining their saliency. Subjects would calculate the expected value of each single decision, which may reduce the significance of any incentives provided. However, several studies do not find a difference between random and deterministic incentives [Beattie and Loomes, 1997; Cubitt et al., 1998; Starmer and Sugden, 1991].

are in line with the results from previous laboratory experiments on dictator games (Engel 2011).

Table 1: Summary statistics of dictators decision

Treatment	*T1*	*T2*	*T3*		
Nature of the recipient's endowment	Riskless	Risky	Riskless ($T3_r$)	Risky ($T3_c$)	All
Number of dictators	57	57	31	34	65
Average transfer in €	2.23 (2.28)	1.79 (2.07)	2.42 (2.25)	1.91 (1.88)	2.16 (2.08)
% of dictators who gives €5	18	9	23	12	17
% of dictators who gives €0	35	40	32	35	34

Notes: Standard deviations in parentheses

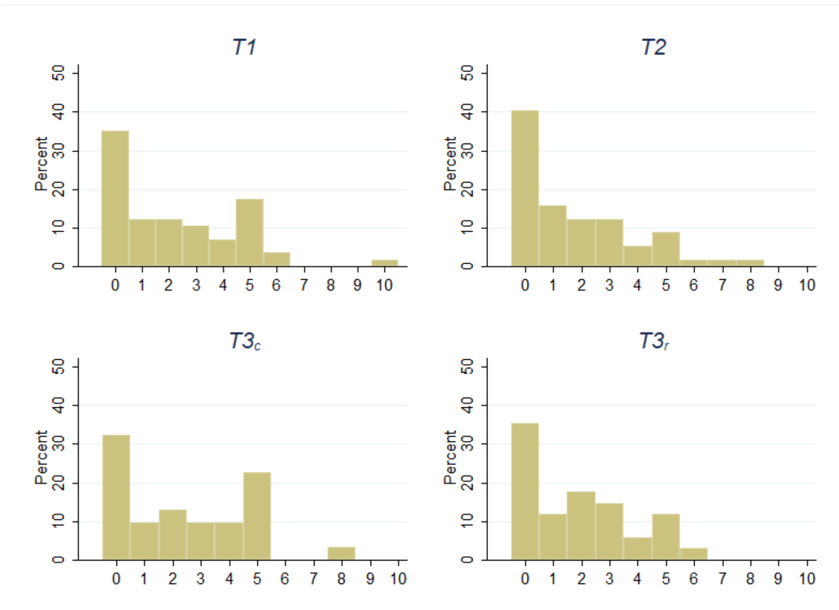
In treatment *T2*, when the recipient's initial endowment is risky, the average transfer is lower than in *T1* and drops €1.79. The proportion of dictators choosing the equal split falls to 9% and that of those who give nothing increases at 40%. However, according to a two-sided Wilcoxon-Mann-Whitney rank-sum test (MW hereafter), the average transfers in the two treatments are not significantly different ($p = 0.313$).[9] An Epps-Singleton nonparametric test (ES hereafter) on the hypothesis of the same distribution is not rejected ($p = 0.524$). We also observe no significant difference between *T1* and *T2* when we only compare the proportion of dictators who give zero or when we condition the sample on those who sent a positive amount.

When we look at the possibility for the recipients to choose the nature of their initial endowment in *T3*, there does not seem to have much difference with *T1* in the proportion of donors and the average amount given. When we separate the subjects according to their choice of endowment and compare them with the first two treatments, three important results emerge. First, those who voluntarily chose the risky endowment (*T3*$_r$) appear to receive less on average than those who received a fixed amount (*T3*$_c$) but the difference is not significant (MW: $p = 0.423$; ES: $p = 0.748$). Second, there is no difference between the transfers made to those who receive a fixed endowment in *T1* and those who have chosen to receive a fixed endowment in *T3*$_c$ (MW: $p = 0.687$; ES: $p = 0.922$). Third, there is also no difference between those who faced a risky endowment in *T2* and those who have actually chosen the risky endowment in *T3*$_r$ (MW: $p = 0.611$; ES: $p = 0.699$). There is also no difference regarding the proportion of dictators choosing the equal split and that of those who give nothing. These results are confirmed by Figure 1, which shows no important

[9]Given a sample size of 57 subjects per treatment and a common standard deviation of 2, the difference required to detect it as significantly different from zero at a 5% level (Type I error) and with a power of the test at 80% (Type II error) is 1.05. The power of finding a difference of 0.44, as between $T1$ and $T2$ in Table 1 is approximately 25%, which is rather low.

changes in the distribution of transfers between the four cases.[10] Moreover, as shown in Figure 1 The proportion of dictators giving 7 or more is almost zero in all treatments. In $T1$, one dictator gives 10. In $T2$, two dictators give 7 and 8, respectively, and in $T3$, one dictator with a certain endowment gives 8.

Figure 1: Distribution of transfers by treatment and nature of the recipients' endowment



Average transfers presented in Table 1 display no significant difference between treatments. These descriptive results contradict the prediction that the presence of background risk on the recipient's wealth provides a negative or positive incentive to give for dictators, Overall the results clearly contradict the possibility that the subjects made their decisions based on a purely *ex post* view of fairness such that their preferences are based exclusively on final payoffs, as was predicted by Propositions 3 and 4. In addition, the results contradict the possibility that the subjects made their decisions based on a purely *ex ante* view of fairness and high risk aversion or high risk seeking, as was predicted by Proposition 2. On the other hand, our observations are consistent with other-regarding preferences exhibiting a purely *ex ante* view of fairness, independently of the fairness model considered, as was predicted by Proposition 1.

To confirm these results, Table 2 reports regressions that explains the decision to give when

[10]Except for the proportion of those equally splitting the endowment, the differences between treatments are not significant.

controlling for several factors. In particular, we introduce as explanatory variables the dictator's risk tolerance and the dictator's belief about the recipient's risk tolerance. We also control for gender, the field of study, the importance of religious aspect in daily life, and we introduce session fixed effects to control for potential correlations between observations in the same session [Frechette, 2012]. In specifications (1), (2), (3) and (6), we report Tobit estimations of the determinants of the amount transferred by the dictator to the recipient. In specifications (4)-(5) and (7)-(8), we report Probit estimations of the determinants of the choice of an equal split and of the choice to give nothing to the recipient.

In specification (1), we look at the effect of the risky endowment when it cannot result from the recipient's choice, and we find no significant differences between treatments. There is no significant effect of the dictator's risk tolerance on the amount transferred to the recipient, neither has the belief about the recipient's risk tolerance[11]. In specifications (2)-(5), we test the difference between our three treatments. We include interaction effects between the treatments, $T2$ and $T3$, and the dictator risk preferences. Specification (2) shows the same qualitative results as in (1). There is no significant difference between the three treatments. Also, there is no effect of the risk preferences on the decision to give in the two treatments where the recipient can have a risky endowment. In specification (3), we control for the choice made by the recipient in *T3*. Because it is highly correlated with the dictator's belief about the recipient's risk preference, we remove the latter from all regressions once we control for the recipient's choice[12]. Here again, while controlling for a series of factors, the choice made by the recipient does not impact the transfer made by the dictator. In specifications (4) and (5), we look at the treatment effect on the proportion of egalitarian behavior and purely selfish behavior with a Probit estimation. Table 2 shows no significant difference between treatments on the probability of splitting equally the endowment or to give nothing. There is also no effect of risk tolerance on the decision.

Interestingly, when we look at treatment *T3* alone, we observe a significant (although at a 10% threshold only) and positive effect of the individual degree of risk tolerance on the amount sent. On the contrary, the effect is negative on the probability of sending zero. This tends to confirm the results obtained by Cettolin et al. [2017] that showed that giving is positively and

[11] We only present the main results in Table 2, but we also performed a series of additional regressions in which we interact our treatments variables with risk preferences. These regressions do not add qualitative results. All the results are also robust to the use of other specifications such as OLS, robust estimators and sessions clustered standard errors.

[12] The correlation between the two variables is 0.301 and significantly different than zero at 5%. A linear regression explaining the belief about the recipientï¿½s risk preference by choice of the endowment by the recipient gives a very significant positive coefficient (p-value<1%). These results raise the question of multicollinearity if we use both variables in the same specification.

significantly associated with risk-seeking attitude when the recipient's wealth is risky. In our case, this effect only appears when the dictator knows that the situation is actually due to the recipient's choice. We also interact the beliefs about the recipient's risk preferences with the choice of the risky endowment. The results are not presented here, but they do not display any effect on the recipient's choice.

Table 2: Determinants of individual choices

Treatments:	*T1,T2*	*T1,T2,T3*				*T3*		
Dependent variable:	Transfer	Transfer	Transfer	Equal split	Zero sent	Transfer	Equal split	Zero sent
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
T2	2.366	1.803	1.727	0.058	-0.630			
	(1.414)	(1.096)	(1.054)	(0.062)	(-0.887)			
T3		-0.222	-0.397	0.113	0.184			
		(-0.129)	(-0.204)	(0.113)	(0.224)			
Risk seeking	-0.026	-0.004	0.016	0.036	-0.030	0.206*	0.047	-0.106*
	(-0.237)	(-0.027)	(0.114)	(0.509)	(-0.514)	(1.744)	(0.699)	(-1.800)
Other's risk seeking	0.174	0.094						
	(1.065)	(1.069)						
T2*Risk seeking		-0.082	-0.065	-0.021	0.027			
		(-0.406)	(-0.325)	(-0.181)	(0.328)			
T3*Risk seeking		0.172	0.273	0.065	-0.099			
		(0.911)	(1.177)	(0.563)	(-0.944)			
T3*risky endow.			-0.232	0.471	0.098	-1.024	-0.536	0.316
			(-0.123)	(0.489)	(0.127)	(-1.386)	(-1.273)	(0.865)
T3*Risk endow.*Risk seeking			0.097	-0.066	-0.045			
			(0.442)	(-0.553)	(-0.485)			
Constant	-0.463	-0.603	-0.230	-2.035***	0.018	-0.213	-1.369	0.278
	(-0.283)	(-0.406)	(-0.157)	(-2.617)	(0.030)	(-0.130)	(-1.548)	(0.367)
N	114	179	179	179	179	65	65	65
pseudo R^2	0.029	0.027	0.028	0.095	0.065	0.041	0.096	0.135

Notes: t-statistics are in parentheses and * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. All regressions contain control for gender, field of study, religion importance and sessions fixed effects. Specifications (1), (2), (3) and (6) report Tobit model left and right-censored and specifications (4), (5), (7) and (8) report Probit models.

3.3 Robustness test: within-subject design

So far, the results show no effects of the background risk affecting the recipient's payoffs on the giving behavior of the dictator. It confirms previous observations by Brock et al. [2013] and Krawczyk and Lec [2010] that show that preferences based on purely *ex post* comparisons cannot explain giving decisions under risk. However, both studies could not disentangle between *ex ante* and *ex post* views of fairness with their design. Brock et al. [2013] still observe that dictator's giving decision is affected by the recipient's exposure to risk. Which is not the case in our experiment.

To confirm our between-subject results, we implement an additional experiment as a robustness test. The choices are exactly the same as before , except that the treatments are implemented in a within-subject design. This experiment has the advantage of being comparable to previous studies that used within-subject design [Brock et al., 2013; Cettolin et al., 2017; Krawczyk and Lec, 2010]. As in the between-subject experiment, in the first part, subjects are paired, and one subject is the dictator, while the other is the recipient. They play under the condition that the recipient's endowment is certain. In the second part, subjects were allocated to a new pair, and the recipient's endowment is risky.[13] The endowment and the lottery are the same as before.

To account for possible order effects, we ran two treatments denoted $T_{1\text{-}2}$ and $T_{2\text{-}1}$. In $T_{1\text{-}2}$, subjects first played *T1* (the recipient's endowment is riskless) and then *T2* (the recipient's endowment is risky). The roles stay the same in the two parts. In $T_{2\text{-}1}$, subjects first play *T2* and then *T1*. Again, the roles remain the same in both parts of the treatment. For sake of comparability with the between-subject experiment, we elicited individual risk tolerance using the portfolio choice task, as well as dictators' belief about recipients' risk tolerance. To keep the potential gains similar in the two experiments, one of the three games was randomly chosen for payment.[14]

The within-subject treatments were also conducted at the LEES. In total 132 students took part in 6 sessions, which corresponds to 66 dictator-recipient pairs. There were 66 subjects in the 3 sessions of $T_{1\text{-}2}$ (66.67% of whom were female) and 66 in the 3 sessions of $T_{2\text{-}1}$ (54.55% of whom were female). Average earnings were €12.1 with a standard deviation of €5.9.

Figure 2 and Table 3 presents the results. On average, we find no significant difference between the amount transferred in *T1* (€1.86) and *T2* (€1.68). When played first, *T1* and *T2* gives the same average amount sent to the recipient, €2.21 and €2.15 respectively. Also when they are played second, we observe a drop in the average amount transferred to €1.51 in *T1* and €1.21 in *T2*. There

[13] We did not introduce the possibility for the recipient to choose between a certain and a risky endowment since we did not observe a significant difference with the two first treatments in the between-subject design. It allows us also to control for order effects more easily.

[14] For details, see the instructions in the appendix.

Table 3: Summary statistics of dictators decision - within-subject design

Recipient's endowment	*T1* Riskless	*T2* Risky
	Average transfer in €	
Total	1.86 (1.82)	1.68 (2.01)
$T_{1\text{-}2}$	2.21 (1.89)	1.21 (1.52)
$T_{2\text{-}1}$	1.51 (1.70)	2.15 (2.33)
	% of dictators who gives €5	
Total	17	14
$T_{1\text{-}2}$	24	6
$T_{2\text{-}1}$	9	21
	% of dictators who gives €0	
Total	35	45
$T_{1\text{-}2}$	24	45
$T_{2\text{-}1}$	45	45
Number of dictators	33	33

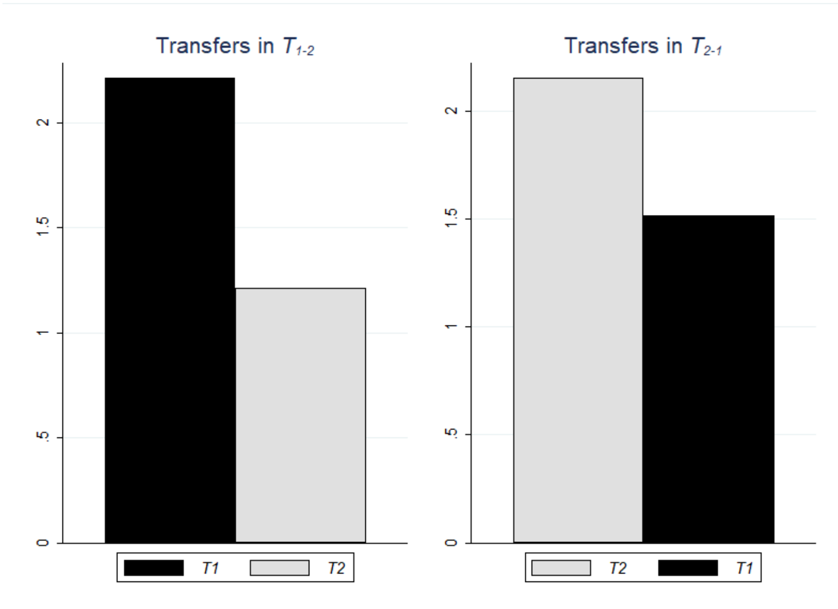
Notes: Standard deviations in parentheses

is no significant difference between *T1* and *T2* in both cases.[15] However, there is a significant order difference for each *T1* and *T2*. For the same subjects, transfers are significantly higher in *T1* than in *T2* when *T1* is played first (Wilcoxon match-pairs signed rank test: $p = 0.005$). Similarly, transfers are higher in *T2* than in *T1* when *T2* is played first (Wilcoxon match-pairs signed rank test: $p = 0.023$). Interestingly, we observe well-known results for repeated dictator games where gifts tend to decline during the periods, but we do not observe an effect of the nature of the recipient's endowment.

Looking at the percentage of dictators who choose the equal split or decide to send zero, we again find no significant difference between *T1* and *T2*, in total or taking into account the order they are played. We observe no significant difference in the proportions dictators that do not change their decision between treatments (42.42% in $T_{1\text{-}2}$, and 48.48% in$T_{2\text{-}1}$). Our design does not allow us to identify truly selfish types of dictators (that always transfer nothing) as in Engel and Goerg [2018]. But while they found that some nonselfish dictators give positive amounts where there is more risk,

[15]There is no significant difference between *T1* and *T2* when both are played first (MS: $p = 0.579$; ES: $p = 0.110$) or when both are played second (MS: $p = 0.569$; ES: $p = 0.501$).

Figure 2: Distribution of transfers by treatment - within-subject design



the proportion of zero transfer does not differ between our treatments.

As a final robustness test, we also pooled the data from the between design and the within design to increase the number of observations and gain some statistical power. We performed similar regressions to Table 2 while controlling for the design: either within or between subjects. The results are qualitatively similar and confirm the absence of statistical difference between treatments. The results are not presented here but are available upon request.[16]

4 Conclusion

Several recent papers have been interested in studying social behavior in situations that involve risk. In particular, the question to know if and how individual giving decisions are affected when the donors do not know with certainty the recipient's wealth is still open. To answer this question, it is necessary to understand how social or other-regarding preferences are affected in the presence of risk.

[16]Although we do not observe differences between our two experimental designs, we must acknowledge that the decision making is not fully comparable since in the within-subjects design, participants had to make three decisions, instead of two in the between-subject design, with only one being actually paid.

In this paper, we have provided theoretical results and empirical evidence from laboratory experiments. In contrast to the previous literature, except Engel and Goerg [2018], the risk we have considered is an actuarially neutral additive and exogenous background risk that remains independent of the dictator's decision. By comparing situations in which the recipient's initial endowment is risky or not, and because in all situations the expected value of the recipient's payoff is kept constant, we can differentiate between *ex ante* and *ex post* view of fairness. In addition, we contrast our results with diverging predictions of inequality averse models from Fehr and Schmidt [1999] and Bolton and Ockenfels [2000].

Contrary to Engel and Goerg [2018], our experimental data show no statistically significant impact of the recipient's risk exposure on dictators' giving decisions. This result appears robust to both the experimental design (within subjects or between subjects) and the origin of the recipient's risk exposure (chosen by the recipient or imposed on the recipient). Regarding the predictions of alternative fairness theories and assumptions, we show that, using the functional forms proposed by Fehr and Schmidt [1999] and Bolton and Ockenfels [2000], either a positive or negative impact on donation is predicted for a large range of the values of the parameters of the preferences functions. However, no impact is also predicted for some range of parameters value. Therefore, our experimental results cannot sharply validate or invalidate alternative theories. However, we conclude that the whole pattern of our experimental data can be simply explained by assuming *ex ante* view of fairness and risk neutrality.

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Appendix

4.1 Proof of Proposition 2

We first consider Fehr and Schmidt [1999]'s preferences function. Substituting $d(g) = 15 - g$ and $r(g) = 5 + g - \pi$ in (5), the dictator's preferences function is

$$u_3(g) = 15 - g - \alpha \max\{2g - 10 - \pi, 0\} - \beta \max\{10 - 2g + \pi, 0\} \tag{8}$$

or, equivalently,

$$u_3(g) = \begin{cases} [-2\alpha - 1]\, g + 10\alpha + 15 + \alpha\pi & \text{for} \quad g \geq 5 + \frac{1}{2}\pi \\ [2\beta - 1]\, g - 10\beta + 15 - \beta\pi & \text{for} \quad g \leq 5 + \frac{1}{2}\pi \end{cases} \tag{9}$$

where $\alpha \geq \beta$ and $0 \leq \beta < 1$. Observe that $u_3' = u_1'$. Therefore, if (i) $\frac{1}{2} < \beta < 1$, u_3 is first increasing and then decreasing above the kink point at $5 + \frac{1}{2}\pi$, where $u_3(5 + \frac{1}{2}\pi) = 10 - \frac{1}{2}\pi$. The optimal donations is $g_3^* = 5 + \frac{1}{2}\pi$. If (ii) $\beta = \frac{1}{2}$, u_3 is first flat, then decreasing above the kink point. The optimal donation is between 0 and $5 + \frac{1}{2}\pi$ in this very special case. Let us assume that the optimal donation is $g_1^* = 5 + \frac{1}{2}\pi$. If (iii) $0 \leq \beta < \frac{1}{2}$, u_3 is everywhere decreasing. The optimal donations is $g_3^* = 0$.

Under risk aversion ($\pi > 0$), we have shown that $g_1^* = 5 < 5 + \frac{1}{2}\pi = g_3^*$ in case (i), $g_1^* = 5 < 5 + \frac{1}{2}\pi = g_3^*$ in case (ii), and $g_1^* = g_3^* = 0$ in case (iii). Therefore we have shown that $g_1^* \leq g_3^*$ everywhere, that is, for any parameter value of the Fehr and Schmidt [1999]'s preferences function. The opposite result obviously holds under risk seeking ($\pi < 0$).

We now consider Bolton and Ockenfels [2000]'s preferences function. Substituting $d(g) = 15 - g$ and $r(g) = 5 + g - \pi$ in (6), the dictator's preferences function is

$$v_3(g) = a\,[15 - g] - \frac{1}{2} b \left[\frac{5 + \frac{1}{2}\pi}{20 - \pi} - \frac{g}{20 - \pi} \right]^2 \tag{10}$$

where $a \geq 0$ and $b > 0$. The Kuhn-Tucker first order conditions are:

$$v_3'(g_3^*) = \frac{\left[5 + \frac{1}{2}\pi\right]}{[20 - \pi]^2} b - a - \frac{1}{[20 - \pi]^2} b g_3^* \begin{cases} \leq 0 & \text{for} \quad g_3^* < 10 \\ \geq 0 & \text{for} \quad g_3^* > 0 \end{cases} \tag{11}$$

Because $v_3'(10) \geq 0$ is equivalent to $a \leq \frac{\frac{1}{2}\pi - 5}{[20 - \pi]^2} b$, where $\pi < 5$, we conclude that $g_1 = 10$

cannot be an optimal choice. On the other hand, we could have $v_3'(0) \leq 0$, which is equivalent to $\frac{a}{b} \geq \frac{5+\frac{1}{2}\pi}{[20-\pi]^2}$. The optimal donation is

$$g_3^* = \begin{cases} 0 \quad \text{for} \quad \frac{a}{b} \geq \frac{5+\frac{1}{2}\pi}{[20-\pi]^2} \\ 5+\frac{1}{2}\pi - \frac{a}{b}[20-\pi]^2 > 0 \quad \text{for} \quad 0 \leq \frac{a}{b} < \frac{5+\frac{1}{2}\pi}{[20-\pi]^2} \end{cases} \tag{12}$$

We observe that $g_3^* \leq 5 + \frac{1}{2}\pi$, and that the treshold $\frac{5+\frac{1}{2}\pi}{[20-\pi]^2}$ increases with π.

Under risk aversion, with $\pi \in (0,5)$, we have shown that: (i) $g_1^* = g_3^* = 0$ if $\frac{a}{b} \geq \frac{5+\frac{1}{2}\pi}{[20-\pi]^2}$, (ii) $g_1^* = 0 < g_3^*$ if $\frac{1}{80} \leq \frac{a}{b} < \frac{5+\frac{1}{2}\pi}{[20-\pi]^2}$, and (iii) $g_1^* < g_3^*$ if $0 \leq \frac{a}{b} < \frac{1}{80}$. Therefore we have shown that $g_1^* \leq g_3^*$ everywhere, that is, for any parameter value of theBolton and Ockenfels [2000]'s preferences function. The opposite result obviously holds under risk seeking , with $\pi \in (-5,0)$. This concludes the proof.

Proof of proposition 3

We first consider the case where the recipient's endowment is certain, as in T1. Substituting $d(g) = 15 - g$ and $r(g) = 5 + g$ in (4), the dictator's preferences function is

$$u_1(g) = 15 - g - \alpha \max\{2g - 10, 0\} - \beta \max\{10 - 2g, 0\} \tag{13}$$

or, equivalently,

$$u_1(g) = \begin{cases} [-2\alpha - 1]\, g + 10\alpha + 15 \quad \text{for} \quad g \geq 5 \\ [2\beta - 1]\, g - 10\beta + 15 \quad \text{for} \quad g \leq 5 \end{cases} \tag{14}$$

where $\alpha \geq \beta$ and $0 \leq \beta < 1$. Observe that $u_1' = 2\beta - 1$ for $g < 5$ and $u_1' = -2\alpha - 1$ for $g > 5$. Therefore, if (i) $\frac{1}{2} < \beta < 1$, u_1 is first increasing, then decreasing above a kink point at $g = 5$ (where $u_1(5) = 10$). The optimal donation is $g_1^* = 5$. If (ii) $\beta = \frac{1}{2}$, u_1 is first flat, then decreasing above the kink point at $g = 5$. The optimal donation is between 0 and 5 in this very special case. Let us assume that the optimal donation is $g_1^* = 5$. If (iii) $0 \leq \beta < \frac{1}{2}$, u_1 is everywhere decreasing. The optimal donation is $g_1^* = 0$.

Now suppose that the recipient's endowment is risky, as in T2. Substituting $d(g) = 15 - g$ and

$\widetilde{r}(g) = (10+g, \frac{1}{2}; g, \frac{1}{2})$ in (5), the dictator's preferences function is

$$u_2(g) = 15 - g - \frac{1}{2}\alpha \begin{bmatrix} \max\{2g-5,0\} \\ +\max\{2g-15,0\} \end{bmatrix} - \frac{1}{2}\beta \begin{bmatrix} \max\{5-2g,0\} \\ +\max\{15-2g,0\} \end{bmatrix} \quad (15)$$

or, equivalently,

$$u_2(g) = \begin{cases} [-2\alpha-1]\, g + 10\alpha + 15 & \text{for} \quad g \geq \frac{15}{2} \\ [-\alpha+\beta-1]\, g + \frac{5}{2}\alpha - \frac{15}{2}\beta + 15 & \text{for} \quad \frac{5}{2} \leq g \leq \frac{15}{2} \\ [2\beta-1]\, g - 10\beta + 15 & \text{for} \quad g \leq \frac{5}{2} \end{cases} \quad (16)$$

where $\alpha \geq \beta$ and $0 \leq \beta < 1$. Observe that $u_2' = 2\beta - 1$ for $g < \frac{5}{2}$, $u_2' = -\alpha + \beta - 1$ for $\frac{5}{2} < g < \frac{15}{2}$ and $u_2' = -2\alpha - 1$ for $g > \frac{15}{2}$. Therefore, if (i) $\frac{1}{2} < \beta < 1$, u_2 is first increasing and then decreasing above the kink point at $g = \frac{5}{2}$ (where $u_2\left(\frac{5}{2}\right) = -5\beta + \frac{25}{2}$). The optimal donation is $g_2^* = 2$, with $u_2(2) = -6\beta + 13 > -\frac{1}{2}\alpha - \frac{9}{2}\beta + 12 = u_2(3)$). If (ii) $\beta = \frac{1}{2}$, u_2 is first flat and then decreases above the kink point. The optimal donation is between 0 and 2 in this very special case. Let us assume that the optimal donation is $g_1^* = 2$. If (iii) $0 \leq \beta < \frac{1}{2}$, u_2 is everywhere decreasing. The optimal donation is $g_2^* = 0$.

We have shown that $g_1^* = 5 > 2 = g_2^*$ in case (i), $g_1^* = 5 > 2 = g_2^*$ in case (ii), and $g_1^* = g_2^* = 0$ in case (iii). Therefore we have shown that $g_1^* \geq g_2^*$ everywhere, that is, for any parameter value of the Fehr and Schmidt [1999]'s preferences function. This concludes the proof.

Proof of proposition 4

We first consider the case where the recipient's endowment is certain, as in T1. Substituting $d(g) = 15 - g$ and $r(g) = 5 + g$ in (6), the dictator's preferences function is

$$v_1(g) = a\,[15-g] - \frac{1}{2}b\left[\frac{1}{4} - \frac{g}{20}\right]^2 \quad (17)$$

where $a \geq 0$ and $b > 0$. The Kuhn and Tucker's first-order conditions are

$$v_1'(g_1^*) = \frac{1}{80}b - a - \frac{1}{400}bg_1^* \begin{cases} \leq 0 & \text{for} \quad g_1^* < 10 \\ \geq 0 & \text{for} \quad g_1^* > 0 \end{cases} \quad (18)$$

Because $v_1'(10) \geq 0$ is equivalent to $80a \leq -b$, we conclude that $g_1 = 10$ cannot be an optimal choice. On the other hand we could have $v_1'(0) \leq 0$, which is equivalent to $b \leq 80a$. The optimal donation is

$$g_1^* = \begin{cases} 0 \quad \text{for} \quad \frac{a}{b} \geq \frac{1}{80} \\ 5 - 400\frac{a}{b} > 0 \quad \text{for} \quad 0 \leq \frac{a}{b} < \frac{1}{80} \end{cases} \tag{19}$$

We observe that $g_1^* \leq 5$.

Now suppose that the recipient's endowment is risky, as in T2. Substituting $d(g) = 15 - g$ and $\widetilde{r}(g) = (10 + g, \frac{1}{2}; g, \frac{1}{2})$ in (7), the dictator's preferences function is

$$v_2(g) = a[15 - g] - \frac{1}{4}b\left[\left[\frac{15 - g}{25} - \frac{1}{2}\right]^2 + \left[\frac{15 - g}{15} - \frac{1}{2}\right]^2\right] \tag{20}$$

The Kuhn and Tucker's first-order conditions are

$$v_2'(g_2^*) = \frac{7}{375}b - a - \frac{17}{5625}bg_2^* \begin{cases} \leq 0 \quad \text{for} \quad g_2^* < 10 \\ \geq 0 \quad \text{for} \quad g_2^* > 0 \end{cases} \tag{21}$$

Because $v_2'(10) \geq 0$ is equivalent to $1125a \leq -13b$, we conclude that $g_2^* = 10$ cannot be an optimal choice. On the other hand we could have $v_2'(0) \leq 0$, which is equivalent to $7b \leq 375a$. The optimal donation is

$$g_2^* = \begin{cases} 0 \quad \text{for} \quad \frac{a}{b} \geq \frac{7}{375} \\ \frac{105}{17} - \frac{5625}{17}\frac{a}{b} > 0 \quad \text{for} \quad 0 \leq \frac{a}{b} < \frac{7}{375} \end{cases} \tag{22}$$

We observe that $g_2^* \leq \frac{105}{17} \simeq 6,2$.

We have shown that: (i) $g_1^* = g_2^* = 0$ if $\frac{a}{b} \geq \frac{7}{375}$, (ii) $g_1^* = 0 < g_2^*$ if $\frac{1}{80} \leq \frac{a}{b} < \frac{7}{375}$, and (iii) $g_1^* < g_2^*$ if $0 \leq \frac{a}{b} < \frac{1}{80}$. Therefore we have shown that $g_1^* \leq g_2^*$ everywhere, that is, for any parameter value of the Bolton and Ockenfels [2000]'s preferences function. This concludes the proof.

Between-subject design: Instructions for the benchmark riskless treatment *T1*

This is a translation of the original French version.

You are about to participate in an experiment to study decision making. Please carefully read the instructions, they should help you understand the experiment. All your decisions are anonymous. You will enter your choices in the computer in front of you.

The present experiment consists of two parts: "Part 1" and "Part 2". The instructions for Part 1 are included hereafter. The instructions for Part 2 will be distributed once everybody has completed Part 1. At the end of the experiment, one of the two parts will be randomly drawn for real pay. You will then be paid in cash your earnings in euros.

During the experiment, you are not allowed to communicate. If you have questions, then please raise your hand, and one experimenter will come to you and answer your question in private.

In this experiment, there were two types of subjects (in equal number): player A and player B. You are randomly assigned a type for the entire experiment. It will be revealed privately before starting the experiment. You will be randomly paired to a player of another type than yours such that one player A is matched with one player B.

Part 1

At the beginning of the game, each player, whatever his/her type, receives an endowment of 5 euros.

Additionally, players A have to share 10 euros between them, and the players B they are paired with. Players A are free to send player B any amount between 0 and 10. The only compulsory limitation is that the amounts are integers (0, 1, 2, etc.). Playersï¿½ B have no decision to make.

The earnings for each type of player are as follows:

- Player A's earnings: 5 euros + (10 euros - the amount sent to player B).
- Player B's earnings: 5 euros + the amount received from player A.

Example 1 : If player A sent 3 euros to the player B.

- Player A's earnings: 5 + (10 - 3) = 12 euros.
- Player B's earnings: 5 + 3 = 8 euros.

Example 2 : If player A sent 5 euros to the player B.

- Player A's earnings: 5 + (10 - 5) = 10 euros.
- Player B's earnings: 5 + 5 = 10 euros.

Example 3 : If player A sent 7 euros to the player B.

- Player A's earnings: 5 + (10 - 7) = 8 euros.
- Player B's earnings: 5 + 7 = 12 euros.

Part 2 (*given at the end of Part 1, identical for all treatments*)

Part 2 is independent from Part 1.

In this part of the experiment, you receive an endowment of 10 euros. You must decide which part of this amount you wish to invest in a risky option. You can choose any amount (in integer only) between 0 and 10.

The risky option consists of a coin toss. The risky option will bring you 3 times the invested amount if heads are drawn and 0 if tails are drawn.

Your final earnings are equal to the amount kept + the earnings of your investment.

Examples :

1. If you decide to invest 5 euros, your earnings will be 20 euros if Heads is drawn (5 euros + 3*5 euros invested in the risky option) and 5 euros if tails are drawn (5 euros + 0*5 euros from your investment in the risky option).
2. If you decide to invest 0 euro, your final earnings will be 10 euros whatever the result of the coin toss.
3. If you decide to invest 10 euros. Your final earnings will be 30 euros if Heads is drawn (0 euro + 3*10 euros invested in the risky option) and 0 euro if Tails is drawn (0 euro kept + 0*10 euros from your investment in the risky option).

To avoid calculations, the table below displays the earnings according to the amount invested in the risky option and the coin toss result.

Investment	Earnings	
	If Heads	If Tails
0	10	10
1	12	9
2	14	8
3	16	7
4	18	6
5	20	5
6	22	4
7	24	3
8	26	2
9	28	1
10	30	0

Between-subject design: Instructions of Part 1 for the risky treatment *T2*

Part 1

At the beginning of the game, player A receives an endowment of 5 euros.

The endowment of player B is risky and depends on coin toss result. If the result of the coin toss is Tails, player B has an endowment of 0 euro. If the result is Heads, player B receives an endowment of 10 euros. The coin toss result will only be known at the end of the experiment.

Additionally, players A have to share 10 euros between them, and the players B they are paired with. The players A are free to send player B any amount between 0 and 10. The only compulsory limitation is that the amounts are integers (0, 1, 2, etc.). Players B have no decision to make.

The earnings for each type of player are as follows:

- Player A's earnings: 5 euros + (10 euros - the amount sent to player B).
- Player B's earnings depend on the result of the coin toss:
  - If Tails, player B's earnings: 0 euros + the amount received from the player A.
  - If Heads, player B's earnings: 10 euros + the amount received from the player A.

Example 1: If player A sent 3 euros to the player B:

- Player A's earnings: 5 + (10 - 3) = 12 euros.
- Player B's earnings:
  - If Tails, player B's earnings: 0 + 3 = 3 euros.
  - If Heads, player B's earnings: 10 + 3 = 13 euros.

Example 2: If player A sent 5 euros to player B:

- Player A's earnings: 5 + (10 - 5) = 10 euros.
- Player B's earnings:
  - If Tails, player B's earnings: 0 + 5 = 5 euros.
  - If Heads, player B's earnings: 10 + 5 = 15 euros.

Example 3: If player A sent 7 euros to player B:

- Player A's earnings: 5 + (10 - 7) = 8 euros.
- Player B's earnings:
  - If Tails, player B's earnings: 0 + 7 = 7 euros.
  - If Heads, player B's earnings: 10 + 7 = 17 euros.

Between-subject design: Instructions of part 1 for the choice treatment *T3*

Part 1

At the beginning of the game, player A receives an endowment of 5 euros.

Player B must make a choice between two alternatives:

- Choice 1: an endowment of 5 euros
- Choice 2: a risky endowment that depends on the result of a coin toss. If the result of the coin toss is Tails, player B has an endowment of 0 euro. If the result is Heads, player B receives an endowment of 10 euros. The coin toss results will only be known at the end of the experiment.

Player A and player B are informed about the choice (1 or 2) made by player B.

Additionally, players A have to share 10 euros between them, and the players B they are paired with. The players A are free to send player B any amount between 0 and 10. The only compulsory limitation is that the amounts are integers (0, 1, 2, etc.).

The earnings for each type of player are as follows:

- Player A's earnings: 5 euros + (10 euros - the amount sent to player B).
- Player B's earnings depend on the choice:
  - If player B made choice 1, player B's earnings: 5 euros + the amount received from the player A.
  - If player B made choice 2, player B's earnings depend on the result of the coin toss:
    - If Tails, player B's earnings: 0 euros + the amount received from the player A.
    - If Heads, player B's earnings: 10 euros + the amount received from the player A.

Example 1: If player A sent 3 euros to the player B:

- Player A's earnings: 5 + (10 - 3) = 12 euros.
- Player B's earnings depend on the choice:

  - If player B made the choice 1: 5 + 3 = 8 euros.
  - If player B made choice 2, player B's earnings depend on the result of the coin toss:
    * If Tails, player B's earnings: 0 + 3 = 3 euros.
    * If Heads, player B's earnings: 10 + 3 = 13 euros.

Example 2: If player A sent 5 euros to player B:

- Player A's earnings: 5 + (10 - 5) = 10 euros.
- Player B's earnings depend on the choice:
  - If player B made the choice 1: 5 + 5 = 10 euros.
  - If player B made choice 2, player B's earnings depend on the result of the coin toss:
    * If Tails, player B's earnings: 0 + 5 = 5 euros.
    * If Heads, player B's earnings: 10 + 5 = 15 euros.

Example 3: If player A sent 7 euros to player B:

- Player A's earnings: 5 + (10 - 7) = 8 euros.
- Player B's earnings depend on the choice:
  - If player B made the choice 1: 5 + 7 = 12 euros
  - If player B made choice 2, player B's earnings depend on the result of the coin toss:
    * If Tails, player B's earnings: 0 + 7 = 7 euros.
    * If Heads, player B's earnings: 10 + 7 = 17 euros.

Within-subject design: Instructions for T_{1-2}

You are about to participate in an experiment to study decision making. Please carefully read the instructions, they should help you understand the experiment. All your decisions are anonymous. You will enter your choices on the computer in front of you.

The present experiment consists of three parts: "Part 1" "Part 2" and "Part 3". The instructions for Part 1 are included hereafter. The instructions for Part 2 and Part 3 will be distributed once everybody has completed the previous part. At the end of the experiment, one of the three parts will be randomly drawn for real pay. You will then be paid in cash your earnings in euros.

During the experiment, you are not allowed to communicate. If you have questions, then please raise your hand, and an experimenter will come to you and answer your question in private.

In this experiment, there are two types of subjects (in equal number): player A and player B. You are randomly assigned a type for the entire experiment. It will be revealed privately before starting the experiment.

Part 1

At the beginning of the experiment, you are randomly paired with a player of type other than yours such that one player A is matched with one player B.

Each player, whatever his/her type, receives an endowment of 5 euros.

Additionally, players A have to share 10 euros between them, and the players B they are paired with. The players A are free to send player B any amount between 0 and 10. The only compulsory limitation is that the amounts are integers (0, 1, 2, etc.).

Players B have an independent decision to take. They must give their opinion on the amount shared by player A of their pair. This prediction has no impact on their payment.

The earnings for each type of player are as follows:

- Player A's earnings: 5 euros + (10 euros - the amount sent to player B).
- Player B's earnings: 5 euros + the amount received from player A.

Example 1 : If player A sent 3 euros to the player B.

- Player A's earnings: 5 + (10 - 3) = 12 euros.
- Player B's earnings: 5 + 3 = 8 euros.

Example 2 : If player A sent 5 euros to the player B.

- Player A's earnings: 5 + (10 - 5) = 10 euros.
- Player B's earnings: 5 + 5 = 10 euros.

Example 3 : If player A sent 7 euros to the player B.

- Player A's earnings: 5 + (10 - 7) = 8 euros.
- Player B's earnings: 5 + 7 = 12 euros.

Part 2 (*given at the end of Part 1*)

Part 2 is independent of Part 1.

At the beginning of this part, you are randomly paired to a player of another type than yours such that one player A is matched with one player B. The pair is different than the one you belonged to in Part 1.

Player A receives an endowment of 5 euros.

The endowment of player B is risky and depends on coin toss result. If the result of the coin toss is Tails, player B has an endowment of 0 euro. If the result is Heads, player B receives an endowment of 10 euros. The coin toss result will only be known at the end of the experiment.

Additionally, players A have to share 10 euros between them, and the players B they are paired with. The players A are free to send player B any amount between 0 and 10. The only compulsory limitation is that the amounts are integers (0, 1, 2, etc.).

Players B have an additional independent decision to make. They must give their opinion on the amount shared by player A of their pair. This prediction has no impact on their payment.

The earnings for each type of player are as follows:

- Player A's earnings: 5 euros + (10 euros - the amount sent to player B).
- Player B's earnings depend on the result of the coin toss:
  - If Tails, player B's earnings: 0 euros + the amount received from the player A.
  - If Heads, player B's earnings: 10 euros + the amount received from the player A.

Example 1: If player A sent 3 euros to the player B:

- Player A's earnings: 5 + (10 - 3) = 12 euros.
- Player B's earnings:
  - If Tails, player B's earnings: 0 + 3 = 3 euros.
  - If Heads, player B's earnings: 10 + 3 = 13 euros.

Example 2: If player A sent 5 euros to player B:

- Player A's earnings: 5 + (10 - 5) = 10 euros.
- Player B's earnings:
  - If Tails, player B's earnings: 0 + 5 = 5 euros.
  - If Heads, player B's earnings: 10 + 5 = 15 euros.

Example 3: If player A sent 7 euros to player B:

- Player A's earnings: 5 + (10 - 7) = 8 euros.
- Player B's earnings:
  - If Tails, player B's earnings: 0 + 7 = 7 euros.
  - If Heads, player B's earnings: 10 + 7 = 17 euros.

Part 3 (*given at the end of Part 2*)

Part 3 is independent of parts 1 and 2.

In this part of the experiment, you receive an endowment of 10 euros. You must decide which part of this amount you wish to invest in a risky option. You can choose any amount (an integer only) between 0 and 10.

The risky option consists of a coin toss. The risky option will bring you 3 times the invested amount if heads are drawn and 0 if tails are drawn.

Your final earnings are equal to the amount kept + the earnings of your investment.

Examples :

1. If you decide to invest 5 euros, your earnings will be 20 euros if Heads is drawn (5 euros + 3*5 euros invested in the risky option) and 5 euros if tails are drawn (5 euros + 0*5 euros from your investment in the risky option).
2. If you decide to invest 0 euro, your final earnings will be 10 euros whatever the result of the coin toss.
3. If you decide to invest 10 euros. Your final earnings will be 30 euros if Heads is drawn (0 euro + 3*10 euros invested in the risky option) and 0 euro if Tails is drawn (0 euro kept + 0*10 euros from your investment in the risky option).

To avoid calculations, the table below displays the earnings according to the amount invested in the risky option and the the coin toss result.

Investment	Earnings	
	If Heads	If Tails
0	10	10
1	12	9
2	14	8
3	16	7
4	18	6
5	20	5
6	22	4
7	24	3
8	26	2
9	28	1
10	30	0

Within-subject design: Instructions for T_{2-1}

The instructions are the same as for T_{1-2} except for the order of Part 1 and Part 2.