Effects of Gain-Loss Frames on Advantageous Inequality Aversion[§]

Kene Boun My[*], Nicolas Lampach[†], Mathieu Lefebvre[‡] and Jacopo Magnani[§]

Abstract

This paper studies individuals' preference for reducing advantageous inequality in the distribution of gains and losses. Combining the inequality aversion model of Fehr and Schmidt (1999) with loss aversion à la Kahneman and Tversky (1979), we predict the relative dislike for advantageous inequality is lower when outcomes are framed as losses than when outcomes are framed as gains. We test this prediction using data from two modified dictator game experiments. Consistent with the model, we find that the amount of payoff that subjects are willing to sacrifice in order to increase the net payoff of others and reduce advantageous inequality is smaller under a loss frame than under a gain frame. The results also show that women are more inequality averse than men in both gains and losses.

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[*] BETA, CNRS and University of Strasbourg, 61 avenue de la forêt noire, 67085 Strasbourg, France.

[†] *Corresponding Author*: KU Leuven, Centre for Legal Theory and Empirical Jurisprudence, 41 Tiensestraat, 3000 Leuven, Belgium; E-mail: `nicolas.lampach@kuleuven.be`; Tel: +32 (0)16377608.

[‡] BETA, University of Strasbourg, 61 avenue de la forêt noire, 67085 Strasbourg, France.

[§] Division of Social Science, New York University Abu Dhabi, Saadiyat Island, PO Box 129188, Abu Dhabi, United Arab Emirates.

Keywords: social preferences, inequality aversion, modified dictator game, loss aversion, laboratory experiment

JEL Classification: C70, C91, D63

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1 Introduction

There is considerable evidence that individuals exhibit a preference to reduce inequality in outcome distributions (see Fehr and Fischbacher, 2006 for a review of this evidence). While most of the literature has studied preferences over the distribution of gains, there are many situations where individuals have to decide how to divide losses. Consider for example citizens of a country deciding how to fund recovery after a natural disaster or roommates deciding how to split a charge for room damages. Although these kinds of situations are frequently encountered, there is little direct evidence on preferences for reducing inequality in the distribution of losses. Moreover, this lack of clear evidence is compounded by the fact that extrapolating results from previous studies to the loss domain is problematic, because individuals typically perceive losses and gains differently (see for example Kahneman and Tversky, 1979).

In this paper, we report an experiment that elicits the subjects' preference to reduce advantageous inequality in the distribution of gains and losses. We analyze behavior in two versions of a modified dictator game (Blanco et al., 2011), one where outcomes are framed as gains and one where outcomes are framed as losses. To derive predictions about the effect of framing, we combine the inequality aversion model of Fehr and Schmidt (1999) with loss aversion in the dictator's own payoff à la Kahneman and Tversky (1979). This model predicts the dictator will choose more unequal distributions in the loss domain than in the gain domain. Intuitively, while the dictator is willing to sacrifice some of his own net payoff in order to increase the net payoff of the recipient, accepting a loss

is more psychologically painful than giving up an equivalent gain. Consistent with this prediction, the experimental results demonstrate that individuals choose on average less equitable payoffs when the game is framed in terms of losses. The estimated parameters of the utility function imply a positive degree of loss aversion. Additionally, the results also suggest that women are more inequality averse than men.

Previous studies in social psychology, such as Loewenstein et al. (1989) and De Dreu (1994), have used surveys to measure subjects' satisfaction with given hypothetical distributions of gains and losses for themselves and another person. Their findings suggest advantageous inequality aversion is weaker in negatively framed problems than in positively framed problems. Poppe and Valkenberg (1993) report an experiment where subjects choose between distributions of gains and losses. They find that a larger fraction of subjects behaved consistently with maximization of their own payoff under the loss frame than under the gain frame. Compared to these works, the use of the modified dictator game allows us to obtain a more reliable and precise measure of advantageous inequality aversion and quantify the framing effect in terms of loss aversion.

A number of recent papers have explored how framing outcomes as losses or gains affects negotiations (e.g. De Dreu et al. (1994), Schweitzer and DeChruch (2001), Carnevale (2008)) and behavior in ultimatum games (Buchan et al. (2005), Leliveld et al. (2009), Zhou and Wu (2011), Neumann et al. (2017)). Studies on ultimatum games typically show that offers and demands are higher when outcomes are framed as losses than in ultimatum games where outcomes are framed as gains. The fact that responders tend to increase their demands when outcomes are framed as losses shows that aversion to disadvanta-

geous inequality increases in this framing. The implications of these ultimatum game experiments for aversion to advantageous inequality are less clear. According to Leliveld et al. (2009), the fact that proposers increase their offers in games where outcomes are framed as losses shows they are reluctant to harm another person to benefit themselves. However, proposer behavior is also affected by strategic considerations: proposers may rationally increase their offers simply because they anticipate that responders demand higher payoffs under a loss frame. Using a dictator game instead of an ultimatum game, we are able to avoid this potential confound. Thus, our experiment complements this strand of the literature because it allows us to provide direct evidence on how framing outcomes as losses affects aversion to advantageous inequality.

We find that the amount of payoff that subjects are willing to sacrifice in order to increase the net payoff of others is smaller under a loss frame than under a gain frame. This is consistent with loss aversion, i.e. the notion that the disutility caused by a loss is larger than the utility of a commensurate gain. Loss aversion can help account for a series of observed behaviors, such as the endowment effect (Kahneman and Thaler, 1991), the sunk-cost fallacy (Samuelson and Zeckhauser, 1988), the equity premium puzzle (Benartzi and Thaler, 1995), risk aversion over small stake gambles (Rabin, 2000) and the effect of labor target earnings (Abeler et al., 2011). Our paper contributes to this literature by studying the interaction between loss aversion and advantageous inequality aversion.

2 Experimental Design

We use data from two experiments that were initially designed to address different research questions than the one at the core of this paper (see Attanasi et al., 2016 and Lampach et al., 2016). The two experiments were run at the same lab but with different subjects. While in both experiments the subjects had to perform several tasks, they first started by playing a modified dictator game (MDG hereafter) similar to Blanco et al. (2011).[1] The only difference between these two MDG designs is that in Attanasi et al. (2016) outcomes are framed as gains while in Lampach et al. (2016) outcomes are framed as losses.[2] We thus refer to these two experiments as the gain treatment and the loss treatment respectively.

In the gain treatment, the dictator has to decide how much of the initial amount of €10 she is willing to pass to the recipient to attain an equal distribution of outcomes. Subjects are presented with a list of 11 pairs of payoff vectors. Each payoff vector (x_i, x_j) specifies a payoff for the dictator, x_i, and a payoff for the recipient, x_j. In each of the 11 decisions, subjects have to choose one of the two payoff vectors. The left payoff vector is always (€10,€0), that is, if this vector was chosen, the dictator would receive €10 and the recipient nothing. The right payoff contains equal payoffs varying from (€0,€0), (€1,€1) all the way to (€10,€10).

In the loss treatment, the type of decision is similar to the gain frame except that sub-

[1] In Attanasi et al. (2016), there were in total three tasks: (i) elicitation of advantageous inequality aversion, (ii) risk aversion, and (iii) a strategic game. Lampach et al. (2016) introduced four tasks in the experiment: (i) elicitation of advantageous inequality aversion, (ii) risk aversion, (iii) ambiguity aversion and (iv) a liability game.

[2] Instructions are presented in Supplementary Materials.

jects decide on potential losses. The left payoff vector is always (€0;€-10) and the right payoff vector contains equal payoffs varying from (€-10,€-10), (€-9,€-9) throughout to (€0,€0). At the end of the experiment, losses are subtracted from a €10 endowment. Thus the distributions that are available to subjects in a given decision are exactly the same between the two treatments in terms of net payoffs.

Table 1 illustrates the payoff vectors used in each treatment. In both treatments, the left option (i.e. the non-egalitarian allocation) was automatically selected in the first decision and similarly the right option (i.e. the egalitarian allocation) was automatically selected in the 11^{th} decision. Subjects had to choose in which decision to switch from the non-egalitarian allocation to the egalitarian allocation. The computer automatically filled in the remaining decisions by selecting the non-egalitarian allocation in each decision preceding the switching point and selecting the egalitarian allocation in each decision following the switching point.

Table 1: Modified Dictator Game in the Gain and Loss Frame

	Gain frame (T_G)		Loss frame (T_L)	
Decision	Option Left	Option Right	Option Left	Option Right
1	(€10,€0)	(€0,€0)	(€0,€-10)	(€-10,€-10)
2	(€10,€0)	(€1,€1)	(€0,€-10)	(€-9,€-9)
3	(€10,€0)	(€2,€2)	(€0,€-10)	(€-8,€-8)
4	(€10,€0)	(€3,€3)	(€0,€-10)	(€-7,€-7)
5	(€10,€0)	(€4,€4)	(€0,€-10)	(€-6,€-6)
6	(€10,€0)	(€5,€5)	(€0,€-10)	(€-5,€-5)
7	(€10,€0)	(€6,€6)	(€0,€-10)	(€-4,€-4)
8	(€10,€0)	(€7,€7)	(€0,€-10)	(€-3,€-3)
9	(€10,€0)	(€8,€8)	(€0,€-10)	(€-2,€-2)
10	(€10,€0)	(€9,€9)	(€0,€-10)	(€-1,€-1)
11	(€10,€0)	(€10,€10)	(€0,€-10)	(€0,€0)

Each treatment consisted of eight sessions. 20 subjects participated in each session. All sessions were run in the Economic Experimental Laboratory at the University of Strasbourg (France). Subjects were recruited with ORSEE (Greiner, 2015). Each subject participated in only one of the two treatments. The two experiments were conducted at two different instances in time: the gain treatment was run in Summer and Fall 2013, while the loss treatment was run in Fall 2015.

In both experiments, subjects did not receive any feedback or payment until the end of the experiment but each task counted towards the calculation of the total gains according to decisions in the tasks. In the MDG, 1 out of the 11 payoff vector pairs is randomly chosen at the end of the experiment to determine the payment. Each subject was also

randomly assigned the role of the dictator or the recipient.

3 Theoretical framework

To interpret the effect of framing in our experiment, we combine the inequality aversion model of Fehr and Schmidt (1999) with loss aversion in the dictator's own payoff à la Kahneman and Tversky (1979). In this framework, the dictator's utility depends on his payoff, advantageous inequality and on whether payoffs are framed as losses or gains. The dictator's utility function is given by:

$$U_i(x_i, x_j) = \begin{cases} x_i - \beta_i \max\{x_i - x_j, 0\} & \text{if } x_i \geq 0 \\ \lambda_i x_i - \beta_i \max\{x_i - x_j, 0\} & \text{if } x_i < 0 \end{cases} \tag{1}$$

where x_i and x_j represent the monetary payoffs to player i (the dictator) and to player j (the receiver) respectively, $\beta_i \geq 0$ is the marginal disutility of advantageous inequality and $\lambda_i \geq 1$ is the loss aversion coefficient. When λ_i is larger than 1, losses count for more than gains in terms of utility. The original Fehr and Schmidt (1999) model includes also a term that captures aversion to disadvantageous inequality, but we omit it here since in our experiment x_i is never less than x_j. An additional assumption of the Fehr and Schmidt (1999) model is that $\beta_i \leq 1$, as this rules out individuals who are willing to throw money away to reduce inequality.

Our experimental design allows us to estimate the relative dislike for advantageous inequality in the gain frame and in the loss frame, denoted β_i^G and β_i^L respectively. These

parameters measure the (maximum) net payoff the dictator is willing to sacrifice to reduce the difference $x_i - x_j$ by one unit. In the gain frame, β_i^G is equal to β_i, while in the loss treatment the relative dislike for advantageous inequality, β_i^L, is given by the ratio β_i/λ_i. Consider first the dictator's choice in the MDG where outcomes are framed as gains. If an individual switches to the egalitarian outcome at $(x_i = \hat{x}_i^G, x_j = \hat{x}_i^G)$, it means that she prefers the unfair allocation $(x_i = 10, x_j = 0)$ over the egalitarian outcome $(x_i = \hat{x}_i^G - 1, x_j = \hat{x}_i^G - 1)$ but prefers $(x_i = \hat{x}_i^G, x_j = \hat{x}_i^G)$ over $(x_i = 10, x_j = 0)$. Following Blanco et al. (2011), we then assume the individual is indifferent between the egalitarian allocation $(x_i = \tilde{x}_i^G, x_j = \tilde{x}_i^G)$ and the unfair allocation $(x_i = 10, x_j = 0)$, where $\tilde{x}_i^G = \hat{x}_i^G - 0.5$. Thus it must be: $U_i(\tilde{x}_i^G, \tilde{x}_i^G) = U_i(10, 0)$, which implies: $\tilde{x}_i^G = 10 - 10\beta_i$. From this we can derive an expression for the relative dislike for advantageous inequality in the gain frame:

$$\beta_i^G \equiv \beta_i = 1 - \frac{\tilde{x}_i^G}{10} \tag{2}$$

In the loss treatment, we can solve for β_i^L similarly as we did for the gain frame. If a subject switches to the egalitarian outcome at $(x_i = \hat{x}_i^L, x_j = \hat{x}_i^L)$ (where $\hat{x}_i^L \in \{-9, \ldots, 0\}$), we infer he is indifferent between $(x_i = 0, x_j = -10)$ and $(x_i = \tilde{x}_i^L, x_j = \tilde{x}_i^L)$, where $\tilde{x}_i^L = \hat{x}_i^L - 0.5$. This means that $U_i(\tilde{x}_i^L, \tilde{x}_i^L) = U_i(0, -10)$, which implies: $\lambda_i \tilde{x}_i^L = -10\beta_i$. It follows that the relative dislike for advantageous inequality in the loss frame is given by:

$$\beta_i^L \equiv \frac{\beta_i}{\lambda_i} = -\frac{\tilde{x}_i^L}{10} \tag{3}$$

Assuming a positive degree of loss aversions ($\lambda_i > 1$), this model predicts the relative

dislike for advantageous inequality will be lower when outcomes are framed as losses than when outcomes are framed as gains: $\beta_i^L < \beta_i^G$. This provides us with an important testable hypothesis. Moreover, the model implies that we can recover an estimate of the loss aversion coefficient from the ratio of our inequality aversion measures as $\lambda_i = \beta_i^G/\beta_i^L$.

4 Empirical results

To analyze the results, we first discuss the distribution of switching points and then focus on our estimates of the relative dislike for advantageous inequality. To compare switching points between the two treatments, it is useful to define the adjusted switching point in the loss frame: $\bar{x}_i^L \equiv 10 + \hat{x}_i^L$, which gives the minimum net payoff the dictator is willing to accept to remove inequality in the loss treatment. The adjusted switching point $\bar{x}_i^L$ is thus directly comparable with the switching point in the gain frame $\hat{x}_i^G$.

Figure 1 displays the cumulative distribution function of the switching point between the unfair and the egalitarian outcome in each treatment. The average value of $\hat{x}_i^G$ is 4.76 with a standard deviation of 2.16 and the average value of $\bar{x}_i^L$ is 6.15 with a standard deviation of 2.51. Both a parametric two-sided t-test ($p_{\text{value}} < 0.001$) and a non-parametric two-sided Mann-Whitney test ($p_{\text{value}} < 0.001$) show this difference is significant. Thus the minimum net payoff the dictator is willing to accept to remove inequality is higher in the loss treatment than in the gain treatment. We then compute the relative dislike for advantageous inequality, β_i^G and β_i^L, for each individual in the gain or loss treatment respectively. We observe a higher relative dislike for advantageous inequality in the gain

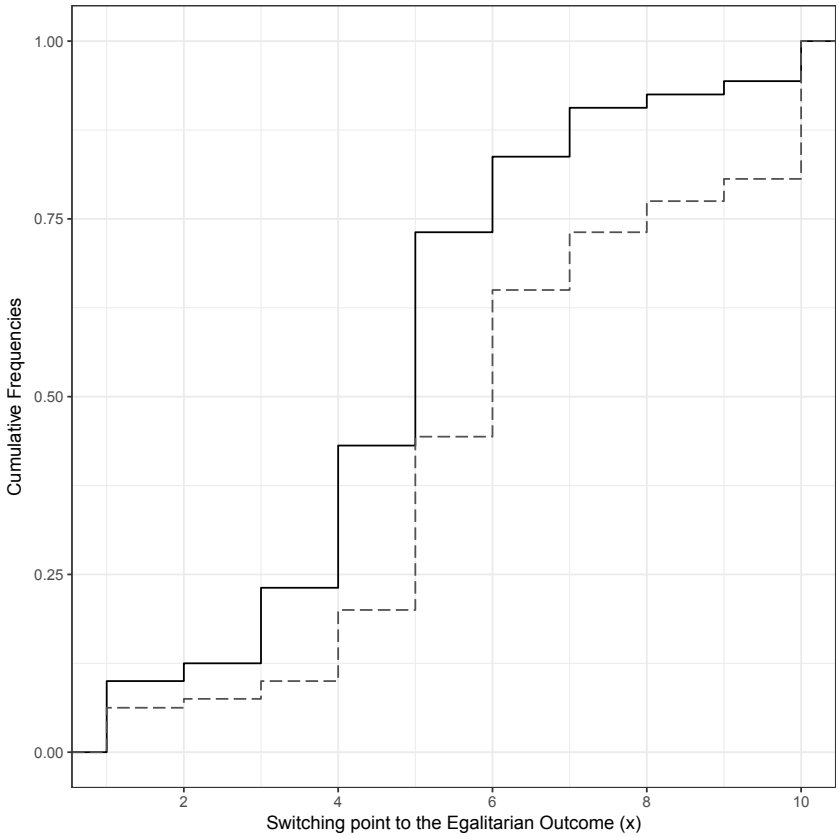


Figure 1: Cumulative Frequencies of the Switching Point to Egalitarian Outcome

Note. The solid line plots the CDF of the switching point in the gain treatment, $\hat{x}_i^G$, where $\hat{x}_i^G$ is defined as the minimum payoff the dictator is willing to accept to remove inequality in the gain treatment. The dashed line plots the CDF of the adjusted switching point in the loss treatment, $\bar{x}_i^L$, which measures the minimum net payoff the dictator is willing to accept to remove inequality in the loss treatment.

frame than in the loss frame: the mean β_i^G is 0.523, while the mean β_i^L is 0.384. Similarly, the median β_i^G is 0.5, while the median β_i^L is 0.4.

Table 2 compares the distributions of β_i^G and β_i^L in our data to the estimates obtained by Blanco et al. (2011) and Beranek et al. (2015). The latter has used the same method as Blanco et al. (2011) and tested the consistence of results among three different subject pools, namely two samples of students from the University of Nottingham and Izmir University of Economics respectively and a sample of US adult residents from the MTurk

Table 2: Distribution of relative dislike for advantageous inequality

	β_i^G	β_i^L	BEN	BCG		
				Nottingham	Izmir	MTurk
$\beta_i < 0.235$	10%	27%	29%	21%	16%	20%
$0.235 \leq \beta_i < 0.5$	17%	28%	15%	25%	11%	19%
$0.5 \leq \beta_i$	73%	45%	56%	54%	73%	61%
χ^2 test to T_G			11.62	8.270	2.670	4.519
p_{value}			0.003	0.016	0.263	0.104
χ^2 test to T_L			5.19	1.738	16.868	5.181
p_{value}			0.074	0.419	0.000	0.075
Sample size	160	160	62	104	206	407

BEN refers to the Blanco et al. (2011) distribution and *BCG* to Beranek et al. (2015).

platform. The distribution of our estimates of β_i^G appears different from the distributions of the β_i parameter estimated by Blanco et al. (2011) and Beranek et al. (2015). Chi square-tests find significant differences between the distribution of our β_i^G estimates and the distribution of estimated β_i in Blanco et al. (2011) as well as in the Nottingham sample of Beranek et al. (2015) (p =0.003 and 0.016 respectively).[3] Chi squared-tests also show that the distribution of our estimates of β_i^L is significantly different from the distribution of β_i obtained by Blanco et al. (2011) and Beranek et al. (2015) (p =0.074) in the Izmir and MTurk samples (p = 0.000 and 0.075 respectively).

To confirm the role of loss aversion in explaining the framing effect in our sample, one can calculate the value of the loss aversion parameter λ implied by our data. Recall that $\beta_i^G = \beta_i$ and $\beta_i^L = \beta_i/\lambda_i$. Thus we can compute an estimate of the loss aversion

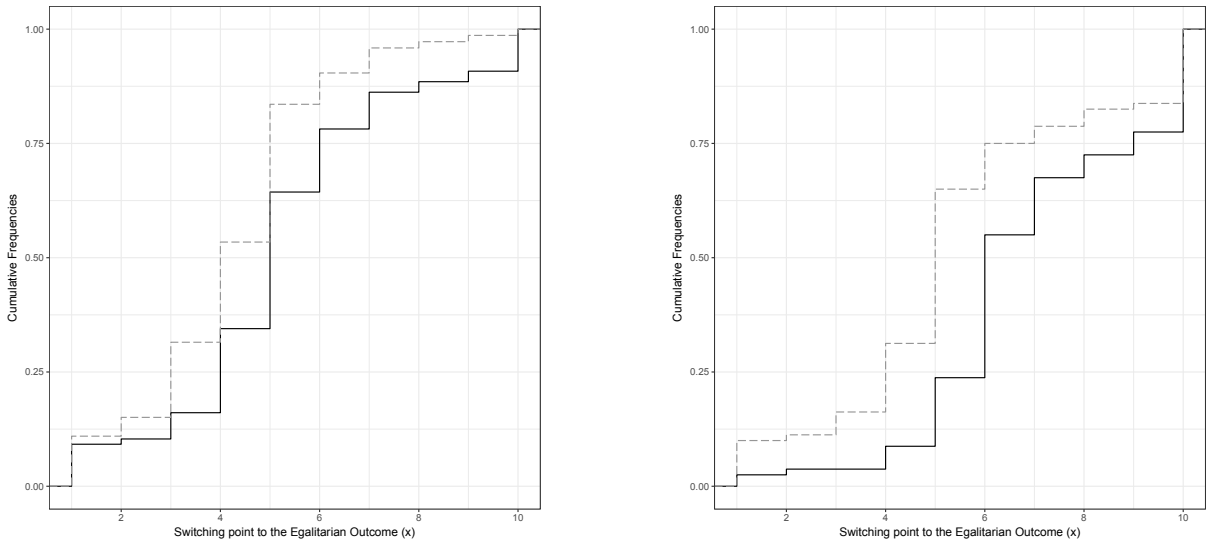
[3]One reason why our gain treatment results are different from those of Blanco et al. (2011) and Beranek et al. (2015) may be that our experiment was run in a different country (France). There are also some differences in the design (e.g. they use a MDG with 21 payoff vectors).

parameter dividing β_i^G by β_i^L. Since we are using a between subject design, we cannot estimate the loss aversion coefficient at the individual level. However, we can calculate the loss aversion coefficient at the aggregate level as $\bar{\lambda} = \bar{\beta}^G/\bar{\beta}^L$, where $\bar{\beta}^G$ and $\bar{\beta}^L$ are the average β_i^G and β_i^L respectively. The value of the loss aversion parameter that we obtain in this way is 1.36, suggesting the disutility caused by a loss is 1.36 times larger than the utility generated by a commensurate gain.[4]

A large literature has emphasized that there are differences in inequality aversion between men and women (see Selten and Ockenfels, 1998; Andreoni and Vesterlund, 2001; Dickinson and Tiefenthaler, 2002; Dufwenberg and Astri, 2005; Croson and Gneezy, 2009; Beranek et al., 2015). We explore this issue in our data. Figure 2 depicts the distribution of $\hat{x}_i^G$ and $\bar{x}_i^L$ for men and women. Women tend to switch to the egalitarian outcome sooner than men: the minimum payoff a dictator is willing to accept to remove inequality is on average lower for female subjects than male subjects. A two-sided Mann-Whitney test indicates significant differences between women and men in the gain treatment ($p_{value} = 0.003$) and in the loss treatment ($p_{value} < 0.001$).

Finally, in Table 3, we regress our measure of the relative dislike for advantageous inequality on our treatment variable, while controlling for a set of factors that could potentially influence individuals' fairness preferences, namely sex, age, level of education and field of study. Standard errors are clustered by session to account for the lack of independence of errors within session (Cameron and Miller, 2015).

[4]Although the initial estimate of loss aversion provided by Tversky and Kahneman (1992) was 2.25, several studies have found lower values. A recent meta-analysis of several papers (Walasek et al., 2018) reports a median λ of 1.31 and a 95% confidence interval between 1.10 and 1.53.



(a) CDF of $\hat{x}_i^G$ (gain treatment)

(b) CDF of $\bar{x}_i^L$ (loss treatment)

Figure 2: Gender Differences in Switching Points

Note: Solid lines are CDF's for men and dotted line are the CDF's for women. Panel (a) plots the CDF's of the switching point in the gain treatment, $\hat{x}_i^G$, where $\hat{x}_i^G$ is defined as the minimum payoff the dictator is willing to accept to remove inequality in the gain treatment. Panel (b) plots the CDF's of the adjusted switching point in the loss treatment, $\bar{x}_i^L$, which measures the minimum net payoff the dictator is willing to accept to remove inequality in the loss treatment.

Table 3: OLS Regression of Gain-Loss Frames on Equality-Seeking Behavior

Dependent variable: β_i		
Variable	Estimate	Std.err
Constant	0.455***	(0.093)
Loss frame	−0.151***	(0.027)
Female	0.114***	(0.026)
Age	−0.001	(0.004)
Bachelor	0.042	(0.029)
Master	0.006	(0.048)
Human and Social Sciences	0.033	(0.033)
Arts and Philosophy	−0.008	(0.039)
Observations	320	
R^2	0.152	
Adjusted R^2	0.133	
Residual Std. Error	0.227 (df = 312)	
F Statistic	7.991*** (df = 7; 312)	

Note: *p<0.1; **p<0.05; ***p<0.01;
Clustered robust standard errors at the treatment level are given in parentheses
Reference category for education: High School
Reference category for field of study: Hard science

The estimation results confirm our previous findings that the relative dislike for advantageous inequality is lower in the loss treatment than in the gain treatment. On average women are significantly more inequality averse compared to men.

5 Conclusion

Monetary losses are encountered in many economic situations as well as in social dilemmas. Understanding the nature of social preferences in the domain of losses is then highly relevant to uncover important characteristics of individual behavior. In this paper, we contribute to the literature on the determinants of other-regarding preferences by providing new evidence on inequality aversion when the outcomes are framed as losses. We find that the amount of payoff that subjects are willing to sacrifice in order to increase the net payoff of others is smaller under a loss frame than under a gain frame. Our analysis suggests that the relative dislike for advantageous inequality is 1.36 times lower in the loss treatment relative to the gain treatment.

While our finding is broadly consistent with the results of previous social psychology studies on this topic, such as Loewenstein et al. (1989), De Dreu (1994) and Poppe and Valkenberg (1993), our results are more in line with standard estimates of the magnitude of loss aversion. For instance, calculations reproduced in the supplementary material show that the results of Loewenstein et al. (1989) imply the relative dislike for advantageous inequality is 10 to 18 times lower under a loss frame relative to a gain frame. These values seem excessively large since estimates of loss aversion are rarely above 3 and a

recent meta-analysis of several papers (Walasek et al., 2018) reports a median λ of 1.31. We conjecture this difference in magnitudes is due to the fact that Loewenstein et al. (1989) used self-reported satisfaction ratings over hypothetical outcomes.

Finally, our findings are helpful in interpreting framing effects in ultimatum games. Previous experiments on the effect of framing in ultimatum games have consistently found that proposers offer more when outcomes are framed as losses rather than gains. Some of these papers (e.g. Leliveld et al., 2009) have concluded that the proposers' dislike of advantageous inequality is stronger in a loss frame than in a gain frame. Our result suggests instead that proposers offer higher net payoffs when they bargain about the division of losses only out of strategic considerations, in spite of, rather than because of, the direct effect of framing on their preferences. Clearly, more evidence is needed to evaluate this hypothesis. Disentangling the effect of framing on the preferences of the different parties involved in bargaining seems an interesting avenue for future research.

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