

Schütze, Tobias; Wichardt, Philipp C.; Wichardt, Philipp Christoph

## Working Paper

A Real Effort vs. Standard Public Goods Experiment: Overall More All-or-Nothing, Lower Average Contributions and Men Become More Selfish in the Effort-Loss Frame

CESifo Working Paper, No. 10444

## Provided in Cooperation with:

Ifo Institute – Leibniz Institute for Economic Research at the University of Munich

*Suggested Citation:* Schütze, Tobias; Wichardt, Philipp C.; Wichardt, Philipp Christoph (2023) : A Real Effort vs. Standard Public Goods Experiment: Overall More All-or-Nothing, Lower Average Contributions and Men Become More Selfish in the Effort-Loss Frame, CESifo Working Paper, No. 10444, Center for Economic Studies and Ifo Institute (CESifo), Munich

This Version is available at:

<https://hdl.handle.net/10419/279193>

### Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

### Terms of use:

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

**A Real Effort vs. Standard  
Public Goods Experiment:  
Overall More All-or-Nothing,  
Lower Average Contributions  
and Men Become More Selfish  
in the Effort-Loss Frame**

*Tobias Schütze, Philipp C. Wichardt*

## **Impressum:**

CESifo Working Papers

ISSN 2364-1428 (electronic version)

Publisher and distributor: Munich Society for the Promotion of Economic Research - CESifo GmbH

The international platform of Ludwigs-Maximilians University's Center for Economic Studies and the ifo Institute

Poschingerstr. 5, 81679 Munich, Germany

Telephone +49 (0)89 2180-2740, Telefax +49 (0)89 2180-17845, email [office@cesifo.de](mailto:office@cesifo.de)

Editor: Clemens Fuest

<https://www.cesifo.org/en/wp>

An electronic version of the paper may be downloaded

- from the SSRN website: [www.SSRN.com](http://www.SSRN.com)
- from the RePEc website: [www.RePEc.org](http://www.RePEc.org)
- from the CESifo website: <https://www.cesifo.org/en/wp>

# A Real Effort vs. Standard Public Goods Experiment: Overall More All-or-Nothing, Lower Average Contributions and Men Become More Selfish in the Effort-Loss Frame

## Abstract

Many environment related public goods require investment of time or effort rather than simply money. Yet, most experimental studies on public good games focus on a distribution of money. In the present paper, we report results from an experiment (N=181) comparing an effort based public goods game (both in gain/loss frame) to a standard (gain/loss) public goods game. We find lower average contributions and more free-riders in the effort treatments. These differences are highly significant statistically and in terms of effects size; the most notable effect showing for men in the loss frame (comparing standard vs. effort, contributions drop from 76.7% to 17.0%, free-riders increase from 8.3% to 82.6%, full-contributors drop from 50.0% to 13.0%). The findings suggest that the provision of environmental public goods faces more impediments than common experimental findings indicate. Moreover, they suggest that especially men become more self-focused when required to mitigate a loss with effort. Given that many environmental public goods are about avoiding losses by taking action and that most political decision makers are still men, the latter result seems to be relevant from a policy perspective.

JEL-Codes: C910, D910, H410, Q540.

Keywords: public goods, real effort, climate change, loss aversion, gender effects.

*Tobias Schütze*  
*Department of Economics*  
*University of Rostock / Germany*  
*tobias.schuetze@uni-rostock.de*

*Philipp C. Wichardt\**  
*Department of Economics*  
*University of Rostock / Germany*  
*philipp.wichardt@uni-rostock.de*

\*corresponding author

This version: May 17, 2023

We are grateful to Anat Bracha, Jens Dietrichson, Tanja Gärtner, Fynn Kemper and Martin Kocher for helpful comments and discussions. The usual disclaimer applies.

# 1 Introduction

Social dilemmas have long since been an important field of research in the social sciences (e.g. Hardin, 1968; Dawes, 1980; Ostrom, 1998; and, more recently, Bonnefon, Shariff, & Rahwan, 2016; Johnson, Dawes, Fowler, & Smirnow, 2020). However, with the increased focus on environmental protection and, in particular, climate change in recent decades, the entailed conflict between individual and collective interests has arguably even further increased in relevance both theoretically, empirically and politically (Barrett, 1994; Milinski, Sommerfeld, Kramback, Reed, & Marotzke, 2008; Gerber & Wichardt 2009; Tavoni, Dannenberg, Kallis, & Löschel, 2011; Heitzig, Lessmann, & Zou, 2011).

Regarding experimental studies, which we will focus on in the present paper, these have mostly relied on versions of (linear) public good games (see Ledyard, 1995, for an older review and Chaudhuri, 2011, for a more recent continuation). In these games players essentially have to distribute some initial endowment between a private and a common account. Investments to the private account, then, benefit only the investing player. Investments to the common account, by contrast, benefit all members of a group, albeit in such a way that returns per investment are positive only for the group as a whole but are below cost for the investing individual. Hence the conflict between individual and social interests. Typical findings in these experiments are that contributions in repeated interactions decrease over time (e.g. Andreoni, 1988; Isaac & Walker, 1988), that institutions such as punishment help to sustain high(er) contribution levels (e.g. Fehr & Gächter, 2000; Kosfeld, Okada, & Riedl, 2009; Balliet, Mulder, & Van Lange, 2011; Gerber, Neitzel, & Wichardt, 2013), or that framing which, for example, increases the salience of the benefit to the group increases contributions to the public good (e.g. Cookson, 2000).

However, many real life social dilemmas do not hinge on the abstract division of some specific resource or money to different accounts but rather on the investment of effort or time for the benefit of a common good (see also Stoop, Noussair, & van Soest, 2009; or Hackel, Yamamoto, Okada, Goto, & Taudes, 2021). This is true, in particular, for various environment related public goods such as environmentalism or climate change. In such situations, the decision maker has to exercise effort in favour of a common benefit at the expense of their own individual comfort.<sup>1</sup> While the abstract problem, of course, remains the same, we hypothesised that real effort decisions might induce a clearer split of contributions in terms of all or nothing.<sup>2</sup>

---

<sup>1</sup>Consider not littering or taking the bike/public transport instead of the car.

<sup>2</sup>Intuitively, it seemed more natural to us to decide for some intermediate position when it comes to an abstract decision about splitting money than in case of a decision to invest own effort and time into a certain project. Put simply, it seems more natural to keep some money to myself when uncertain about the contributions of others to some common good while at the same time taking rather an all or nothing decision about, for example, “not littering”.

In order to test our hypothesis, we conducted a public goods experiment which allowed us to contrast the difference between effort and (common) monetary contributions. In particular, we elicited behaviour in essentially two set-ups: one in which participants had to decide on the allocation of a fixed endowment between a public or a private account (the standard case); and one in which participants had to invest effort into either of two analogous tasks (the effort case), the outcomes of which would be converted into money to the benefit of the group or to themselves, respectively; importantly, a free splitting of effort was possible. Moreover, in order to capture the fact that many environmental public goods are about *protection*, i.e. the avoidance of a loss, rather than the actual *provision* of a certain good, we also conducted both the standard and the effort public goods experiment in a gain as well as in a loss framing.

Note that the experimental set-up differs from earlier experimental research investigating the involvement of real effort into subjects' decision-making in public goods games in various ways. First of all, the subjects' effort itself is what is allocated to the public/private good. Thus, we do not consider ex ante effort in order for subjects to earn some monetary endowment which then can be split between a private and a public account (e.g. Cherry, Kroll, & Shogren 2005; Muehlbacher, & Kirchler, 2009; Harrison, & El Mouden, 2011; Oxoby, & Spraggon, 2013).<sup>3</sup> Also, we do not consider the subjects' willingness to invest parts of some endowment in order to participate in a certain (effort) task which may benefit them or the group (e.g. Filiz-Ozbay, & Ozbay, 2014<sup>4</sup>). Instead, we require the investment of effort per se. In fact, similar to most standard (money based) public good games, subjects in the present study have to distribute effort one way or another (private or group) but benefit more from effort on their own account. Hence, in the effort treatments there is no combination (and possible confusion) of effort aspects and money (cf. Stoop et al., 2009; Hackel et al., 2021), nor is the public good provision purely other regarding (cf. Stoop et al., 2009<sup>5</sup>).

Regarding results, the data show the hypothesised comparably pronounced all-or-nothing tendency in contributions in the effort treatment (fraction of intermediate contributions: 20.4% vs. 80.9%,  $p < 0.001$ ). In addition, we find significantly lower average contributions in the effort setting (overall: 31.4% vs. 50.6%,  $p < 0.001$ , gain: 29.5% vs. 42.6%,  $p = 0.002$ , loss: 33.4% vs. 60.2%,  $p = 0.001$ ). Thus, the data suggest that once

---

<sup>3</sup>Somewhat related, Ekström (2012) conducted an effort-based field experiment in which he investigated charitable giving of money earned through the return of recyclable bottles.

<sup>4</sup>Filiz-Ozbay, & Ozbay (2014) also mainly focus on effects of being observed in their choices; see also Ariely, Barhcha, & Meiser 2009.

<sup>5</sup>Stoop et al. (2009) conduct a field experiment in which fishers at a pond can create a positive externality (money paid to other group members) by restricting the amount of fish caught (private good) below their allotment for a given time. They emphasise how other-regarding contributions may depend on the actual (effort) task at hand (fishing versus payments to the group). Note that in our case effort is to be exerted either way, i.e. the task is de facto the same except for the beneficiary of the effort, so that the effort/monetary comparison is closer to the standard lab case.

contributions involve more than a “simple” decision about a split of some endowment between a private and a group account, contribution behaviour becomes less mixed.

Furthermore, the data exhibit a – for us unexpected – tangible gender difference in the effort-loss treatment. In particular, while both genders tend more towards all-or-nothing in the effort-loss treatment, men in this treatment are predominantly self-focused (free-riders: 82.6%, full-contributors: 13.0%). By contrast, for women both the fraction of free-riders and full-contributors is high (free-riders: 40.6%, full-contributors 34.4%) with the fraction of full-contributors in the effort-loss treatment being actually higher than in the standard-loss treatment (34.4% vs. 10.5%,  $p = 0.059$ ). Accordingly, average contributions for men are much lower in the effort-loss than in the standard-loss treatment (17.04% vs. 76.7%,  $p < 0.001$ ) while staying roughly constant for women (45.1% vs. 49.8%,  $p = 0.476$ ).

Moreover, different from the standard treatment for which average contributions are higher in the loss treatment for both genders (men: 76.7% vs. 57.4%,  $p = 0.067$ ; women: 49.8% vs. 35.5%,  $p = 0.086$ ), in the effort treatment average contributions increase only for women but drop for men (men: 17.0% vs. 33.3%,  $p < 0.05$ , women: 45.1% vs. 26.5%,  $p = 0.054$ ). In fact, for the effort-loss treatment, we also find lower effort levels, which is entirely due to men (number of tokens earned: 81.3 (gain) vs. 75.2 (loss),  $p < 0.05$ , men: 78.1 vs. 64.1,  $p < 0.05$ , women: 83.8 vs. 82.7,  $p = 0.783$ ). Note that the latter observation contrasts with previous findings suggesting increased effort/productivity in loss frames (Hossain & List, 2012; Imas, Sadoff, & Samek, 2016; Farinha, & Maia, 2021) and also with loss aversion more generally (Kahneman, & Tversky, 1979).

From an applied point of view, the results seem relevant in particular for environmental protection policies. First of all, the results confirm earlier findings that contribution levels to public goods tend to decrease if real individual effort is involved (cf. Stoop et al., 2009), as is required in most measures of environmental protection. Moreover, Stoop et al. (2009) consider a restriction of own effort - in a field experiment - in order to create a (arguably artificial) positive monetary externality for others. In view of the aforementioned application, the present study confirms their finding of reduced contributions to a common good even in the - in our view more plausible - case that the actual effort has to be spent either on behalf of the group or the self (in the present case, admittedly in an artificial setting). What is more, the gain-loss comparison included in the present study, shows that the effect is particularly relevant for the prevention of losses – as, for example, in the case of climate change – and for male decision makers.

The rest of the paper is structured as follows: In Section 2, we present the experimental design and procedures. Results are gathered in Section 3 and discussed in Section 4. Section 5 concludes.

## 2 Experimental Design and Procedures

The experiment was conducted pen and paper<sup>6</sup> and consisted of two parts: An effort public goods game (Study 1) and a standard public goods game (Study 2), the latter being framed so as to be comparable to the former. Both parts comprised a gain as well as a loss treatment. In the sequel, we describe the experimental design and procedure for both studies. For ease of exposition, common aspects are described first.

### 2.1 Experimental Design

In each treatment, subjects played a one shot public goods game in random groups of 4 as described below. Decisions were incentivised in that every 10th response was payed as stated<sup>7</sup> with tokens being converted to Euro at a rate of 1 token corresponding to 10 Cent for the private account and 1 token corresponding to 16 Cent for the group account (i.e. 4 Cent per group member). This was part of the instructions and, hence, known to subjects.

#### *Study 1 (effort)*

In the effort public goods game, subjects received two sheets filled with 100 rows of pseudo-randomised sequences of numbers between 0 and 9, one sheet representing the private (labelled “A”) and one the group account (labelled “B”); both sheets were designed equally in order to avoid social effects from feeling observed in choices (e.g. Filiz-Ozbay, & Ozbay, 2014; Rege, & Telle, 2004). The task was to circle all “1”s in a line, to correctly count them and put the respective number in a text box at the end of each row. Subjects were given a fixed amount of time for the task (3 minutes) and were free to switch between the sheets during that time. In the gain treatment, subjects were informed that with each correctly solved row on a sheet, they earned as many tokens as there are “1”s in that row for the corresponding account; per sheet a maximum of 200 tokens could be earned.<sup>8</sup> In the loss treatment, subjects were informed that each sheet was endowed with 200 tokens and that all “1”s of not correctly solved rows on a sheet were lost for the respective sheet/account.

#### *Study 2 (standard)*

In the standard public goods game, subjects had to assign 100 tokens to either a private or a group account. In the gain treatment, subjects had no initial endowment and

---

<sup>6</sup>Pen and paper was chosen in order to get closest to a feeling of real effort as well as to have a natural possibility of switching between tasks.

<sup>7</sup>Regarding the method of payment, Charness, Gneezy & Halladay (2016), reviewing a significant amount of papers, find that paying for only a subset of periods or individuals is at least as effective as the pay all approach.

<sup>8</sup>In order to obtain roughly similar token-outcomes in the effort and the standard treatment, sequences were chosen based on a pretest (roughly targeting 100 tokens to be earned).



distributed a winning of 100 tokens between the private and the public account. – 100 tokens corresponds roughly to what could be earned in the effort treatment.<sup>9</sup> – In the loss treatment, subjects had an initial endowment of 100 tokens on both accounts and had to distribute a loss of 100 tokens between them. Subjects received two sheets on which they allocated the winnings/losses representing the private and the group account (again labelled “A” and “B”, respectively).

Both Study 1 and Study 2 contained a post experimental questionnaire asking about the subjects’ expectations regarding behaviour of others, their general risk attitude (Dohmen, Falk, Huffman, Sunde, Schupp, & Wagner, 2011<sup>10</sup>) and their (hypothetical) willingness to play a fair game in a gain and loss setting.<sup>11,12</sup>

## 2.2 Procedure

The experiment was conducted pen and paper at the end of lectures at the University of Rostock in November/December 2022. After the respective lecture, students were informed about the possibility to participate in a research study and otherwise offered to leave. The subjects who stayed were asked to slightly separate and not to talk during the experiment.<sup>13</sup> They received 3 pages of instructions and a closed envelope not to be opened until explicit calling. The first two pages explained the general public goods game and were read out loud. Page 3 explained treatment specific characteristics and was to be read silently. Instructions had a running number to identify connected sheets. Sessions were for one study only (effort or standard) and contained both gain and loss treatment of the respective study.

After subjects had read the instructions, questions were answered privately by the experimenters. When no further questions arose, a starting signal was given and subjects had 3 minutes to make their decision/work on their task. After that, subjects had to put the answer sheets back into the envelopes and hand those back to the experimenters. Finally, subjects were asked to fill out the questionnaire. Once all material was collected, the subjects to be payed were determined by a 10-sided dice and matching last digits of the running number. Corresponding groups were determined randomly (within treatments) from the remaining pool to establish actual payments, and payments were made.

---

<sup>9</sup>This again is based on a pretest; cf. Footnote 8.

<sup>10</sup>The reliability of the respective question was, for example, also highlighted by Lönnqvist, Verkasalo, Walkowitz, & Wichardt (2015).

<sup>11</sup>In addition, we asked one question about political self-assessment and one about attachment to material things (De Baets, & Buelens, 2012). As we find no effects, both questions are ignored in the analysis.

<sup>12</sup>All instructions and the questionnaire are available from the authors on request.

<sup>13</sup>There were always at least two researchers present during the experimental sessions to monitor the subjects.

### 3 Results

In the sequel, we present and discuss the results of our experiment. We first report the within treatment results for Study 1 (Section 3.1) and Study 2 (Section 3.2). The comparison between treatments (effort vs. standard) is made at the end (Section 3.3). For the sake of comparability between the treatments, we report rates instead of tokens for the analysis, i.e. all individual earnings in the effort study are normalised to 100.

In total, 212 undergraduate students took part in the study (Study 1: 136 subjects, 65 female, 1 diverse; Study 2: 76 subjects, 44 female, 1 diverse), 181 of which were included in the analysis (Study 1: 113, 65 female; Study 2: 68, 44 female).<sup>14</sup>

#### 3.1 Study 1 (Effort)

In the following, we report data on tokens earned, average contributions to the public good, expectations about other group members as well as a classification of behaviour regarding the public good in terms of free-riding, full-contribution and intermediate behaviour. All results refer to normalised effort and are differentiated by treatment (gain/loss).

##### Tokens Earned by Treatment and Gender

Different from standard public goods games, where a certain endowment is to be distributed, the effort public good game contains an additional variable, namely the tokens earned by the subjects. Once we compare gain and loss treatment, averages of these can be taken as a proxy for the average effort exerted.

As shown in Table 1, average tokens earned are roughly the same for men and women in the gain treatment. However, while women earn essentially the same amount of tokens for both treatments, men earn significantly less in the loss treatment indicating that facing a loss leads to reduced effort for men.<sup>15</sup>

**Result 1** *Comparing gain and loss treatment, the average amount of tokens earned is equal for women (83.8 vs. 82.7) and lower in the loss treatment for men (78.1 vs. 64.6,  $p < 0.05$ ).*

---

<sup>14</sup>The 2 diverse student were excluded from the analysis for reasons of sample size. Moreover, in order to preserve a homogeneous sample, we excluded subjects older than 29 (Study 1: 1, Study 2: 2). Finally, we excluded 26 participants whose answers were incompatible with a proper tackling of the task (Study 1: 21; Study 2: 5).

<sup>15</sup>This finding holds also if we focus on the number of rows attended instead of correctly identified and reported “1”. Note that this finding is in contrast previous observations suggesting increased productivity in loss frames (Imas, Sadoff, & Samek, 2016).

	Overall	Male	Female	Diff. M/F
Gain	81.33	78.12	83.76	-5.64
Loss	75.15	64.61	82.72	-18.11***
Diff. G/L	6.18**	13.51**	1.04	

Table 1: Average earned token by condition and gender \*\*\*=  $p < 0.01$ , \*\*=  $p < 0.05$ , \*=  $p < 0.10$ . Differences were tested with a two-sided Mann-Whitney U-Test.

### Average Contributions and Expectations by Treatment and Gender

Overall, we find that subjects on average contribute roughly 30% of their effort / tokens to the group with seemingly similar contributions made in both treatments (29.5% gain vs. 33.4% loss); cf. Table 2. Moreover, average actual behaviour is roughly consistent with overall average expected behaviour (28.4% gain vs. 37.6% loss).

However, male and female subjects are affected differently by treatments. In particular, men on average contribute significantly more in the gain treatment than in the loss treatment (33.3% vs. 17.0%,  $p < 0.05$ ). Women, by contrast, contribute more in the loss-treatment (26.5% vs. 45.1%,  $p = 0.054$ ). Accordingly, comparing average contributions within treatments, we find no differences between male and female subjects in the gain-treatment (33.3% vs. 26.5%,  $p = 0.166$ ) but significantly higher average contributions by female subjects in the loss-treatment (17.0% vs. 45.1%,  $p = 0.006$ ). The observed gender-difference in contributions is also confirmed by a tobit-regression; cf. Table 3. It also shows when comparing individual expectations and behaviour: 64.6% of men (gain: 56.0%, loss: 73.9%) and 38.5% of women (gain: 39.4%, loss: 37.5%) expected contributions by group members to be higher than what they themselves had contributed.

Finally, we want to mention that the tobit-regression, even if extended beyond what is shown in the table, does not show a significant influence of risk-preferences on contributions rates to the effort public good game.

<i>Contributions</i>	Overall	Male	Female	Diff. M/F
Gain	29.45%	33.32%	26.52%	6.81%
Loss	33.38%	17.04%	45.12%	-28.08%***
Diff. G/L	-3.93%	16.28%**	-18.60%*	
<i>Expectations</i>	Overall	Male	Female	Diff. M/F
Gain	28.40%	34.12%	24.07%	10.05%*
Loss	37.56%	31.97%	41.59%	-9.62%
Diff. G/L	-9.17%**	2.15%	-17.52%**	

Table 2: Average contributions and expected contributions by treatment and gender; \*\*\*=  $p < 0.01$ , \*\*=  $p < 0.05$ , \*=  $p < 0.10$ . Differences were tested with a two-sided Mann-Whitney U-Test.

	(1)	(2)	(3)
Loss(=1)	0.058 (0.380)	0.019 (0.379)	-1.330** (0.650)
Female(=1)		0.425 (0.390)	-0.591 (0.519)
Female * Loss			2.252** (0.866)
Constant	-0.325 (0.292)	-0.547 (0.369)	0.013 (0.371)
N.Obs.	113	113	113
Pseudo $R^2$	0.000	0.006	0.045

Table 3: Contribution rate. Tobit-regressions, gain as reference treatment. \*\*\*=  $p < 0.01$ , \*\*=  $p < 0.05$ , \*=  $p < 0.10$ .

**Result 2** *Men contribute more in the gain treatment (33.3% vs. 17.0%,  $p < 0.05$ ) and women contribute more in the loss treatment (26.5% vs. 45.1%,  $p < 0.10$ ). Average expected contributions roughly match average actual contributions, except for men in the loss treatment whose expectations remain similar to the gain and, hence, mismatch average behaviour. Men also earn fewer tokens in the loss treatment.*

### All-or-Nothing Behaviour by Treatment and Gender

In order to assess if and how behaviour in an effort public good experiment tends more towards extremes, we grouped subjects according to their contributing behaviour as either free-riders (0%), full-contributors (100%), or intermediate-contributors. Focusing on aggregate data, we indeed find a high tendency towards extremes. In particular, we observe roughly 57% free-riders and 23% full-contributors with no significant differences between treatments; cf. Table 4.

	Free-riders	Intermediate-contributors	Full-contributors
Gain	55.17%	24.14%	20.69%
Loss	58.18%	16.39%	25.45%
Diff. G/L	-3.01%	7.75%	-4.76%

Table 4: Type of contribution behaviour by treatment. \*\*\*=  $p < 0.01$ , \*\*=  $p < 0.05$ , \*=  $p < 0.10$ . Differences were tested with two-sided Test of Proportions.

The seeming treatment-independence of contribution behaviour, however, is due to reverse reactions to treatment by different genders; see Figure 1. More specifically, there are considerable more male free-riders in the loss treatment (40.0% vs. 82.6%) and less full- (20.0% vs. 13.0%) and intermediate-contributors (40.0% vs. 4.3%). By contrast, for

female subjects, we find the opposite, i.e. less free-riders in the loss treatment (66.7% vs. 40.6%) as well as more full- (21.2% vs. 34.4%) and intermediate-contributors (12.1% vs. 25.0%). Thus, once confronted with a loss, women exert more effort for the group, while men become more self focused – and exert overall less effort (cf. Result 2).

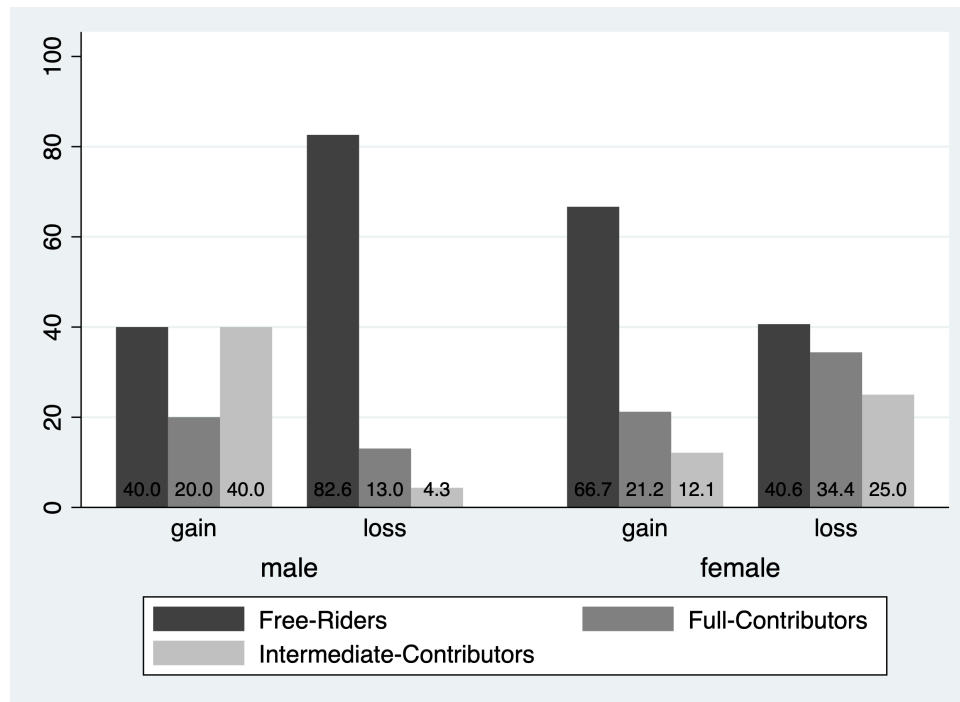


Figure 1: Type of contribution behaviour by treatment and gender.

These gender differences are also confirmed by a multinomial logit-regression; cf. Table 5. Additionally, the regression shows that gain-seeking subjects<sup>16</sup> are less likely to be free-riders (model 4 and 5).

**Result 3** *Overall, we find high – and seemingly constant – rates of free-riders and full-contributors. However, this is due to men and women showing reverse reactions to treatments: 40.0% of men free-ride (66.7% women), 20.0% contribute fully (21.2% women) in the gain treatment; 82.6% of men free-ride (40.6% women), 13.0% contribute fully (34.4% women) in the loss treatment.*

<sup>16</sup>This refers to differences in answers to the ex post questions about the willingness to take a fair gamble double-or-nothing in case of gains or losses.

	(1)		(2)		(3)		(4)	
	A	B	A	B	A	B	A	B
Loss(=1)	0.442 (0.495)	0.596 (0.581)	0.441 (0.495)	0.593 (0.584)	2.944*** (1.119)	1.792 (1.278)	2.534** (1.143)	1.583 (1.292)
Female(=1)			0.099 (0.489)	0.721 (0.598)	1.705** (0.704)	1.253 (0.832)	1.493** (0.731)	1.141 (0.841)
Female * Loss					-4.164*** (1.323)	-2.033 (1.497)	-3.847*** (1.355)	-1.841 (1.512)
Loss-Averse							0.770 (1.159)	0.899 (1.248)
Gain-Seeking							-1.275** (0.598)	-0.463 (0.665)
Constant	0.827*** (0.320)	-0.154 (0.393)	0.774* (0.411)	-0.592 (0.540)	0.000 (0.447)	-0.693 (0.548)	0.771 (0.634)	-0.402 (0.751)
N.Obs.	113		113		113		113	
Pseudo $R^2$	0.005		0.014		0.083		0.119	

Table 5: Multinomial logit-regression of type of contribution behaviour; A = free-rider, B = full-contributor, baseline = intermediate-contributor. \*\*\*=  $p < 0.01$ , \*\*=  $p < 0.05$ , \*=  $p < 0.10$ .

### 3.2 Study 2 (standard)

In the following, we report data average contributions to the standard public good, expectations about other group members as well as a classification of behaviour regarding the public good in terms of free-riding, full-contribution and intermediate behaviour. All results are differentiated by treatment (gain/loss) were relevant.

#### Average Contributions and Expectations by Treatment and Gender

Overall, subjects on average contribute 42.6% (gain) and 60.2% (loss) of their endowment to the public good depending on the treatment, which is roughly in line with common findings (cf. Chaudhuri, 2011<sup>17</sup>); see Table 6 for reference. Moreover, both genders contribute more in the loss than in the gain treatment (men: 76.7% vs 57.4%,  $p < 0.1$ ; women: 49.8% vs 35.5%,  $p < 0.1$ ). Yet, the data show a clear difference between genders in that women on average give significantly less than men in both treatments. Furthermore, while we find a general increase in contribution in the loss treatment, this is not the case for expectations which show no significant increase for either gender. Also the fraction of subjects expecting higher contributions of others remains roughly constant (Gain: 40.5% – men: 33.3%, women: 44.0%; Loss: 35.5% – men: 25.0%, women: 42.1%); note that here the majority of men in the loss treatment expect others to contribute less than they themselves do (we will get back to this in the next subsection where we compare effort and standard treatment).

<sup>17</sup> “In one-shot versions of the public goods game, there is much more contribution than predicted in the Nash equilibrium of the game. Groups of participants on average contribute between 40% and 60% of the optimal level with wide variations in individual contributions ranging from 100% contribution by some to 0% by others.” (Chaudhuri, 2011, p. 48).

<i>Contributions</i>	Overall	Male	Female	Diff. M/F
Gain	42.59%	57.42%	35.48%	21.94%**
Loss	60.19%	76.67%	49.79%	26.88%**
Diff. G/L	-17.60%**	-19.25%*	-14.31%*	
<i>Expectations</i>	Overall	Male	Female	Diff. M/F
Gain	45.14%	56.67%	39.60%	17.07%***
Loss	50.32%	57.50%	45.79%	11.71%
Diff. G/L	-5.18%	-0.83%	-6.19%	

Table 6: Average contributions and expected contributions by treatment and gender. \*\*\*=  $p < 0.01$ , \*\*=  $p < 0.05$ , \*=  $p < 0.10$ . Differences were tested with Two-sided Mann-Whitney U-Test.

In addition, we conducted several tobit-regressions in order to investigate determinants of contribution behaviour; cf. Table 7. Focusing on risk-attitudes, we find an interaction with gender (model 3) suggesting that more risk-affine *females* contribute less while more risk-affine *males* tend to contribute more to the public good ( $p = 0.115$ ). In addition, based on the corresponding ex post question, we classified subjects as either gain-seeking (more risk-affine in gain-domain), loss-averse (more risk-affine in the loss-domain), or indifferent. Adding this classification to the regression, we again find an interaction with the treatment (cf. model 5), suggesting that gain-seeking subjects contribute significantly less to the loss-framed public good. In other words, the loss-condition only influences indifferent and loss-averse subjects but not gain-seekers.

	(1)	(2)	(3)	(4)	(5)	(6)
Loss(=1)	0.217** (0.083)	0.200** (0.076)	0.188** (0.075)	0.227*** (0.075)	0.449*** (0.120)	0.454*** (0.118)
Female(=1)		-0.297*** (0.080)	0.048 (0.186)	-0.291*** (0.078)	-0.281*** (0.074)	0.065 (0.173)
Risk-Attitude		0.000 (0.017)	0.044 (0.028)			0.045* (0.025)
Female * Risk-Attitude			-0.071** (0.035)			-0.070** (0.032)
Loss-Averse				-0.067 (0.100)	-0.017 (0.117)	-0.007 (0.114)
Gain-Seeking				-0.167** (0.084)	0.043 (0.107)	0.069 (0.105)
Loss * Loss-Averse					-0.135 (0.200)	-0.168 (0.195)
Loss * Gain-Seeking					-0.451*** (0.161)	-0.479*** (0.158)
Constant	0.425*** (0.056)	0.624*** (0.117)	0.408** (0.156)	0.693*** (0.083)	0.605*** (0.087)	0.371** (0.154)
N.Obs.	68	68	68	68	68	68
Pseudo $R^2$	0.090	0.268	0.323	0.322	0.432	0.497

Table 7: Contribution rate, tobit-regression, gain treatment as reference. \*\*\*=  $p < 0.01$ , \*\*=  $p < 0.05$ , \*=  $p < 0.10$ .

**Result 4** *Men contribute more and expect higher contributions than women in both treatments. For both genders average contributions are higher in the loss treatment; this change is particularly strong for men (76.7% vs. 57.4%,  $p < 0.1$ ) but is not reflected in expectations about contributions of others which stay constant around 57% for men. Controlling for risk- and loss- aversion, we find that more risk-affine women contribute less while more risk-affine men tend to contribute more. Finally, the loss-framing affects loss-averse and indifferent but not gain-seeking subjects.*

### All-or-Nothing Behaviour by Treatment and Gender

As in Study 1, we also classified subjects in terms of their contribution behaviour; cf. Table 8. The data show that overall the proportion of free-riders remains constant between treatments (5.4% vs. 3.3%). Yet, once the public good game is framed in terms of losses, the fraction of intermediate-contributors drops (89.2% vs. 71.0%,  $p < 0.1$ ) and considerably more subjects contribute their full endowment (5.4% vs. 25.8%,  $p < 0.05$ ).

	Free-rider	Intermediate-contributor	Full-contributor
Gain	5.41%	89.19%	5.41%
Loss	3.23%	70.97%	25.81%
Diff. G/L	2.18%	18.22%*	-20.40%**

Table 8: Type of contribution behaviour by treatment. \*\*\*=  $p < 0.01$ , \*\*=  $p < 0.05$ , \*=  $p < 0.10$ . Differences were tested with two-sided Test of Proportions.

Controlling for gender, we find that differences are mainly driven by male subjects for whom we find fewer intermediate-contributors (83.3% vs. 41.7%,  $p < 0.5$ ) and more full-contributor (16.70% vs. 50.0%,  $p < 0.1$ ) in the loss treatment; see Figure 2. By contrast, female subjects mostly make intermediate-contributions in both treatments (around 90%); yet, there is a change in that the remaining female subjects free-ride in the gain condition (8.0%) and fully-contribute in the loss condition (10.5%).

Finally, we conducted a multinomial logit-regression with the behavioural classification as target variable to confirm these observations; cf. Table 9. Here, we find an interaction between gender and risk-attitude: for male subjects, being more risk-affine increases to probability of being a fully-contributor compared to being an intermediate-contributor. By contrast, for more risk-affine female subjects there is a significant negative interaction reducing this probability. Free-riding is unaffected; risk-preferences as well as an interaction with the treatment remains insignificant.



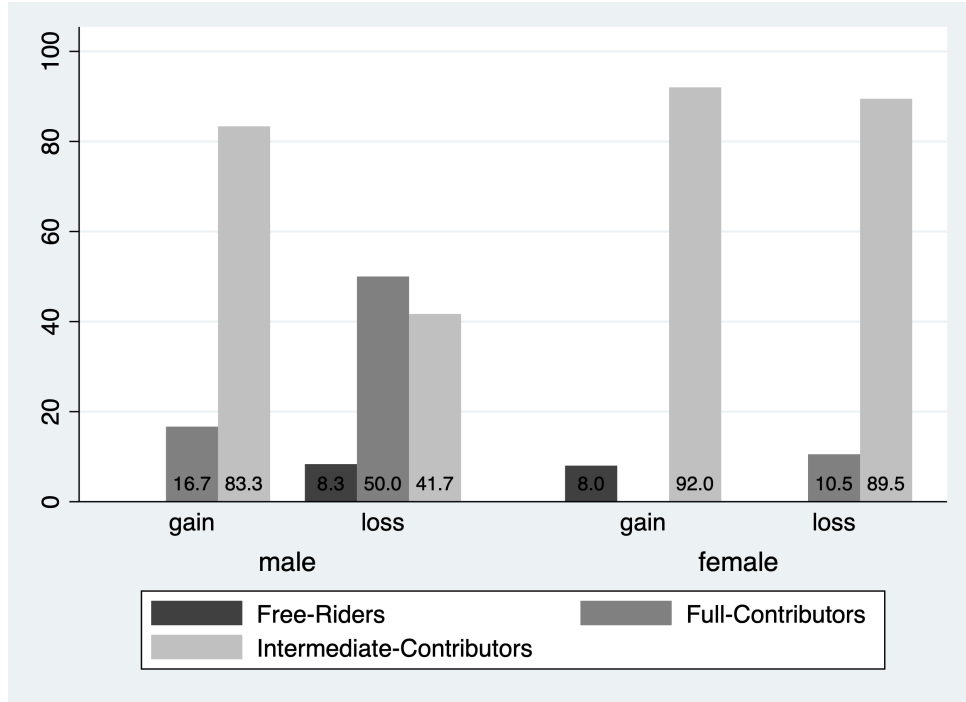


Figure 2: Type of contribution behaviour by treatment and gender.

	(1) A	B	(2) A	B	(3) A	B	(4) A	B
Loss(=1)	-0.288 (1.255)	1.792** (0.837)	-0.126 (1.273)	2.001** (0.921)	-0.096 (1.284)	2.214** (1.068)	-0.190 (1.297)	2.199** (0.973)
Female(=1)			-0.132 (1.294)	-2.358*** (0.899)	2.133 (4.910)	2.795 (2.168)	-0.298 (1.271)	-2.508*** (0.928)
Risk-Attitude			0.338 (0.324)	0.232 (0.187)	0.614 (0.618)	0.616** (0.285)		
Female * Risk-Attitude					-0.396 (0.732)	-1.231** (0.544)		
Loss-Averse							0.471 (1.464)	-1.168 (1.295)
Gain-Seeking							-0.199 (1.486)	-1.531 (0.957)
Constant	-2.803*** (0.728)	-2.803*** (0.728)	-4.566* (2.370)	-3.028** (1.347)	-6.201 (4.411)	-5.343*** (2.069)	-2.684** (1.365)	-1.139 (0.853)
N.Obs.	68		68		68		68	
Pseudo $R^2$	0.073		0.229		0.323		0.236	

Table 9: Multinomial logit-regression of type of contribution behaviour. A = free-rider, B = full-contributor, baseline = intermediate-contributor. \*\*\*=  $p < 0.01$ , \*\*=  $p < 0.05$ , \*=  $p < 0.10$ .

**Result 5** *Overall, extreme contribution behaviours are rare ( $< 20\%$  for all but one genders and treatments), with the exception of male subjects in the loss treatment (58%). Moreover, we find that more risk-affine male subjects are more likely full-contributor while risk-attitudes show no correlation for female subjects. Also, loss-aversion shows no impact on type of behaviour.*

### 3.3 Comparison Effort (Study 1) vs. Money (Study 2)

Finally, we provide a comparison of the behavioural effects in Study 1 and Study 2. As we will see, there are considerable differences in behaviour depending on whether the public good requires a contributions in terms of effort (Study 1) or in terms of shares of an initial endowment (Study 2). As our main hypothesis was about an increase in extreme behaviours (all-or-nothing), these effects are discussed first.

#### All-or-Nothing Behaviour

Consistent with our hypothesis, we find that behaviour in the effort treatment is indeed highly more split into extremes; cf. Table 10. In the standard public good game, 89.1% of the subjects in the gain treatment and 71.0% of the subjects in the loss treatment make intermediate contributions. By contrast, in the effort setting, only 24.1% of subjects in the gain and 16.4% of subjects in the loss treatment truly divide their contribution.

Moreover, as pointed out in Section 3.1, the difference in numbers for the loss treatment also show a gender effect which we find for the effort study but not for the standard one. In particular, while the number of free-riders increases for both genders in both treatments, only the share of women making full contributions in the effort setting also increases in both treatments while men in the effort-loss treatment become essentially more selfish (recall that men also in the effort-loss treatment also exert less effort). In fact, while in the standard loss setting, a much larger share of men make full contributions (50.0% men vs. 10.5% women) these numbers are almost reversed for the effort loss case (13.0% men vs. 34.4% women).

**Result 6** *Subjects in the effort setting exhibit a much stronger all-or-nothing behaviour (intermediate-contributors standard: 89.2% (gain), 71.0% (loss); effort: 24.1% (gain), 16.4% (loss)). In the loss treatments, effects for men and women are reversed: in the standard game, men account for most full contributions (50.0% vs. 10.5%), in the effort case more women do so (34.4% vs. 13.0%).*

#### General Contributions and Expectations

Consistent with the overall fraction of free-riders being substantially higher for the effort public goods game, we find that also average contributions are tangibly higher for

	Standard	Effort	Difference
<i>Contributions</i>			
Gain	42.59%	29.45%	13.14%***
Male	57.42%	33.32%	24.10%**
Female	35.48%	26.52%	8.96%**
Loss	60.19%	33.38%	26.81%***
Male	76.67%	17.04%	59.63%***
Female	49.79%	45.12%	4.67%
Overall	50.62%	31.36%	19.26%***
<i>Expectations</i>			
Gain	45.14%	28.40%	16.74%***
Male	56.67%	34.12%	22.55%***
Female	39.60%	24.07%	15.53%***
Loss	50.32%	37.56%	12.76%**
Male	57.50%	31.97%	25.53%***
Female	45.79%	41.59%	4.20%
Overall	47.50%	32.86%	14.64%***
<i>Free-riders</i>			
Gain	5.41%	55.17%	-49.76%***
Male	0%	40.00%	-40.00%**
Female	8.00%	66.70%	-58.70%***
Loss	3.23%	58.18%	-54.95%***
Male	8.33%	82.61%	-74.28%***
Female	0%	40.63%	-40.63%***
Overall	4.41%	56.64%	-52.23%***
<i>Intermediate-contributors</i>			
Gain	89.19%	24.14%	65.05%***
Male	83.33%	40.00%	43.33%**
Female	92.00%	12.12%	79.88%***
Loss	70.97%	16.36%	54.61%***
Male	41.67%	4.35%	37.32%***
Female	89.47%	25.00%	64.47%***
Overall	80.88%	20.35%	60.53%***
<i>Full-contributors</i>			
Gain	5.41%	20.69%	-15.28%**
Male	16.67%	20.00%	-3.33%
Female	0%	21.21%	-21.21%**
Loss	25.81%	25.45%	0.36%
Male	50.00%	13.04%	36.96%**
Female	10.53%	34.38%	-23.85%*
Overall	14.71%	23.01%	-8.30%

Table 10: Average behaviour. \*\*\*=  $p < 0.01$ , \*\*=  $p < 0.05$ , \*=  $p < 0.10$ . Differences in contributions and expectations were tested with Two-sided Mann-Whitney U-Test; Differences in strategies with Two-sided Tests of Proportions.

the standard public goods game (standard: 42.6% (gain), 60.2% (loss); effort: 29.5% (gain), 33.4% (loss)); cf. Table 10. This observation is also compatible with the subjects' expectations about the behaviour of others being lower in the effort treatments.

Moreover, the gender effect for the loss treatments also shows for contributions and expectations – in fact, with a special twist. More specifically, contra to the overall tendency, average contributions of women in the loss treatment remain roughly the same for the effort and the standard game, as do their expectations regarding others. By contrast, for men average contribution in the effort-loss treatment are much lower than in the standard-loss treatment (17.0% vs. 76.7%), although expectations about the contributions of others drop much less (32.0% vs. 57.5%). In fact, for men the comparison between average contributions and average expectations regarding contributions of others shows a completely different picture for the different loss treatments. While men on average contribute more than they expect of others in the standard-effort treatment (76.7% vs. 57.5%) they on average contribute considerably less than what they expect of others in the effort-loss treatment (17.0% vs. 32.0%)

**Result 7** *Overall, average contributions to the public good are lower in the standard game than in the effort game (42.6% (gain), 60.2% (loss) vs. 29.5% (gain), 33.4% (loss), respectively). In the loss treatments, both average contributions and average expectations regarding others for women stay roughly constant. By contrast, men on average contribute more than they expect in the standard game (76.7% vs. 17.0% / 57.5% (expectations)) while contributions are below expectations in the effort case (17.0% vs. 32.0%).*

### Further Aspects

In addition to the above aspects, some observations from the above regression analyses regarding the determinants of individual behaviour deserve a mention. More specifically, for the standard public good game, the data show a significant influence of risk preferences on contribution to the group account, albeit with different directions for different genders (positive for men, negative for women) – a connection that does not show in the effort game. Moreover, it seems that the elicited parameters have a higher explanatory power regarding the observed variance in the standard game than in the effort study (Pseudo  $R^2$ : 0.497 vs. 0.045). This suggests that actual effort choices in the respective strategic situation are more complex than the distribution of some given endowment; see Section 4 for further discussion.

## 4 Discussion

In the sequel, we briefly discuss the above results and their connection with as well as possible implication for the related literature. As before, the discussion is organised along different overarching topics.

### Some General Aspects

To begin with, note that our primary hypothesis – that actual effort contributions would turn out to be more all-or-nothing – was driven by an intuition saying that making a decision about the division of a certain endowment allows for a more conscious cognitive response than contributing effort. In a sense, the former decision comprises only one aspect (how much endowment to give to which account) while the latter entails more (which account to start with, switch or not, how much effort to invest). Arguably, deciding about the division of a certain endowment makes it a lot more natural to “try both accounts and see what happens” or to incorporate normative ideas about sharing with the group into ones decision. From this perspective, the decision in the effort-setting indeed is more complex (splitting numbers is easier than splitting effort, calculating outcomes and marginal benefits becomes difficult, the involvement of a simple task still requires attention especially if time-pressure is involved). And it may well be that people prefer to take the safe option and avoid further uncertainty when complexity rises.

While of course only speculative, we see the higher explanatory power of the few elicited background variables in the standard game (with roughly similar numbers of participants in both studies) as an indication that the intuition about a higher complexity of the effort task mentioned above contains at least a grain of truth. We emphasis this point here as we believe that it touches on the general question of external validity of experimental studies (see, for example, Dutcher, Salmon, & Saral, 2015, for a discussion), where we see the effort task to be intuitively at least closer to many relevant social dilemmas than the endowment division choice.

### All-or-Nothing Behaviour

As we have seen, presenting a public good problem in terms of effort to be exerted either for ones own benefit or the benefit of the group leads to strongly increased all-or-nothing behaviour regarding contributions to the public good. We can only speculate about reasons for why this is the case. However, we believe that one possible reason may lie in the increased complexity of the effort condition (see above) – we see this as a similarity with many real life public good problems people are confronted with. Arguably, a simple way to reduce the complexity of the corresponding task is to focus on one type of contribution (private or group) and to not spend any further cognitive resources on

the actual distribution decision.

Note that the complexity explanation is also compatible with earlier findings showing that earning the endowment instead of receiving a windfall does not change contribution behaviour in the public good game (e.g. Cherry, Kroll, & Shogren 2005, Harrison, & El Mouden, 2011; Oxoby, & Spraggon, 2013). Muehlbacher, & Kirchler (2009) find that working harder for the endowment reduces cooperativeness, though, an effect we find no equivalent for in our data. These results suggest that involvement of effort directly in the decision-making process has an considerable higher impact on decision-making than when the effort is implemented prior to the decision – a design of procedures that arguably reduces complexity of single decisions though the sequential structure.

### **Effects of the Loss Framing**

Regarding the results of the loss-framing of the public good problem, we find that these are two-folded. On the one hand, in the standard-game, loss-framing increases average contributions significantly for male and female subjects. This behaviour can be interpreted of an increased risk taking in the face of losses (cf. Kahneman, & Tversky, 1979). On the other hand, in the effort-game, we find this effect only for women; in the loss-treatment, the data show higher average contributions for women – compared to the gain-treatment – and also fractions of female full- and intermediate-contributors are higher. By contrast, the vast majority of men in the loss-treatment free-ride and average contributions of men drop considerable compared to the gain-treatment. What is more, men in the loss-treatment also exert less (average) effort. Both observations regarding men seem counter-intuitive in view of common ideas of loss aversion (cf. Kahneman, & Tversky, 1979).

A possible explanation for the more self-focused behaviour of men in the effort-loss treatment refers to the implementation of the loss-frame. In Study 1, subjects face a loss and have to work against it (mitigate it). By contrast, in Study 2 subjects have to work with the loss (distribute it). Thus, it might be that for subjects the actual decision over the loss rather than the loss as by-product is needed to trigger loss-aversion. Although we cannot say why this might be the case, we find evidence for this explanation by investigating risk-preferences (see Section 3.3). In fact, in the standard public good game, the loss-framing affected loss-averse and loss-neutral subjects but not gain-seekers. Yet, we find no such interaction in the effort-setting, suggesting that loss-aversion is indeed triggered for receptive subjects in the standard- but not in the effort-condition. This observation remains robust even if we control for gender-differences in contributions due to reverse gender effects of the risk-attitudes.

Another possible explanation, of course, would be that the involvement of effort overrides influences of loss-aversion. In this case, we would expect loss-aversion to affect

effort provision, though. Yet, contrary to previous results (Hossain, & List, 2012; Imas, Sadoff, & Samek, 2016; Farinha, & Maia, 2021), we find no increased effort under the loss frame but rather a decrease for men.<sup>18</sup> Thus, we are inclined believe that either the implementation of the loss-frame (as discussed above) or possibly again complexity issues lead to male subjects responding differently to the effort-loss treatment than women.

While admittedly only speculative, we want to emphasise at this point that if the difference between mitigating a loss and simply distributing it has such a strong effect on men, this may be of considerable practical importance. Obviously, most environmental public goods are about mitigation of some sorts – CO2 emissions, pollution, .. – and in many cases the relevant decision makers on a political level are still men.

Finally, we want to comment on a further effect in connection with experimental studies around loss aversion which has been argued for previously and which might have had an impact on behaviour also in our studies. In particular, there seems to be a “house-money” effect referring to more risk-taking with windfall money than with own money, which has been observed in public goods games with mixed results (e.g. Harrison, 2007; Jing, & Cheo, 2013, Bailey, Ramalingam, & Stoddard, 2022). For example, Jin, & Cheo (2013) find significantly higher contributions in a gain-framed than in a loss-framed house money public goods game. Yet, they find no difference between a house money loss- vs. own money loss-frame and, hence, conclude that there is no house money effect in the loss-frame but only in the gain-frame.

In the present context, subjects might indeed perceive the situation in the standard public good game as decisions over house money because every decision results in “free” money for the subject. However, in the effort public good game, subjects have to invest their own resources and investing nothing could lead to zero outcomes. Accordingly, the absence of house money-effects in the effort setting could be a reason why we find much lower contributions in the effort-conditions. Following Jin and Cheo (2013), we would expect no difference between the effort-loss and the standard-loss treatments as the authors reject house money effects in the loss domain. Yet, we do find higher contributions in the standard-loss treatment than in the effort-loss treatment (60.2% vs. 33.4%). While it might be the case that the house money-effect works for female subjects (49.8% vs. 45.1%) but not for male subjects (76.7% vs. 17.0%), we believe that the reason for the observed differences lies deeper and necessitates insights beyond the scope of this paper.

---

<sup>18</sup>Gender-differences in response to gain/loss frames were also found by Apostolova-Mihaylova, Cooper, Hoyt, & Marshall (2015) in an educational field study. They observe that male students performed better and female students worse under a loss-frame. McEvoy (2016) finds no gender-effect and overall better performance a the loss-frame.

## 5 Concluding Remarks

In the present paper, we have presented results from a pen an paper public goods experiment comparing a standard “distributing endowment” setting with a “distributing effort” one, which we believe to be closer to many real life social dilemmas. Both settings were presented in a gain and in a loss frame as most environmental public good problems, e.g. related climate change, are typically discussed in terms of (potential) losses rather than gains.

The data show that in the effort setting subjects tend considerably more towards all-or-nothing behaviour in their contributions to the public good. As we have argued in the discussion of our results in Section 4, this might be seen as an attempt at reducing complexity of the task at hand if we take the effort task (working on a task plus deciding on which account) to be more complex than the endowment distribution decision.

Moreover, while the data show increased contributions to the public good in standard-loss treatment - as could be expected in view of prospect theory (Kahneman, & Tversky, 1979) – we find no such effect for the effort-loss treatment. In particular, contrary to what we would have expected, men in the effort-loss treatment exert less effort and in addition become tangibly more self-focused – both of which does not show for women.

While we can only speculate about reasons (cf. Section 4), we believe that our findings highlight patterns in behaviour which are likely to be relevant for many pressing environmental policy issues. Eventually, most environmental protection policies are about exerting effort in order to save something that is already there or to mitigate detrimental effects. Moreover, in many instances the relevant decision makers on a political level are still men. Hence, it may well be that the way the corresponding environmental problems are framed (gain or loss, effort or rather endowment) has a larger impact on eventual enacted policies than might have been transparent.

And even if policy making should turn out to be too abstract to be affected by effects as the ones described in this paper, in the end roughly half of the “subjects” that have to either comply to or avoid following the respective policies will be men.



## References

- Andreoni, J. (1988). Why free ride?: Strategies and learning in public goods experiments. *Journal of Public Economics*, 37(3), pp. 291-304.
- Apostolova-Mihaylova, M., Cooper, W., Hoyt, G., & Marshall, E. C. (2015). Heterogeneous gender effects under loss aversion in the economics classroom: A field experiment. *Southern Economic Journal*, 81(4), pp. 980-994.
- Ariely, D., Bracha, A., & Meier, S. (2009). Doing good or doing well? Image motivation and monetary incentives in behaving prosocially. *American Economic Review*, 99(1), pp. 544-555.
- Balliet, D., Mulder, L. B., & Van Lange, P. A. (2011). Reward, punishment, and cooperation: a meta-analysis. *Psychological Bulletin*, 137(4), pp. 594-614.
- Bailey, N.T., Ramalingam, A. & Stoddard, B.V (2022). Experimental (re-)analysis of the house-money effect in a public goods game. *Journal of the Economic Science Association*, in print.
- Barrett, S. (1994). Self-Enforcing International Environmental Agreements. *Oxford Economic Papers*, 46 Supplement 1, pp. 878–894.
- Bonnefon, J. F., Shariff, A., & Rahwan, I. (2016). The social dilemma of autonomous vehicles. *Science*, 352(6293), pp. 1573-1576.
- Charness, G., Gneezy, U., and Halladay, B., 2016. Experimental methods: Pay one or pay all. *Journal of Economic Behavior & Organization*, 131, pp. 141-150.
- Chaudhuri, A. (2011). Sustaining cooperation in laboratory public goods experiments: a selective survey of the literature. *Experimental Economics*, 14, pp. 47–83.
- Cherry, T. L., Kroll, S., & Shogren, J. F. (2005). The impact of endowment heterogeneity and origin on public good contributions: evidence from the lab. *Journal of Economic Behavior & Organization*, 57(3), pp. 357-365.
- Cookson, R. (2000). Framing effects in public goods experiments. *Experimental Economics*, 3(1), pp. 55-79.
- Dawes, R. M. (1980). Social dilemmas. *Annual Review of Psychology*, 31(1), pp. 169-193.
- De Baets, S., & Buelens, M. (2012). Development of the loss aversion questionnaire.

- Dohmen, T., Falk, A., Huffman, D., Sunde, U., Schupp, J., & Wagner, G. G. (2011). Individual risk attitudes: Measurement, determinants, and behavioral consequences. *Journal of the European Economic Association*, 9(3), pp. 522-550.
- Dutcher, E. G., Salmon, T. C., & Saral, K. J. (2015). Is "Real" Effort More Real?, MPRA Paper 68394.
- Ekström, M. (2012). Do watching eyes affect charitable giving? Evidence from a field experiment. *Experimental Economics*, 15, pp. 530-546.
- Farinha, A. C., & Maia, T. V. (2021). People exert more effort to avoid losses than to obtain gains. *Journal of Experimental Psychology: General*, 150(9), pp. 1837–1853.
- Fehr, E., & Gächter, S. (2000). Cooperation and Punishment in Public Goods Experiments. *The American Economic Review*, 90(4), pp. 980–994.
- Filiz-Ozbay, E., & Ozbay, E. Y. (2014). Effect of an audience in public goods provision. *Experimental Economics*, 17, pp. 200–214.
- Gerber, A., & Wichardt, P. C. (2009). Providing public goods in the absence of strong institutions. *Journal of Public Economics*, 93(3-4), pp. 429-439.
- Gerber, A., Neitzel, J., & Wichardt, P. C. (2013). Minimum participation rules for the provision of public goods. *European Economic Review*, 64, pp. 209-222.
- Hackel, J., Yamamoto, H., Okada, I., Goto, A., & Taudes, A. (2021). Asymmetric effects of social and economic incentives on cooperation in real effort based public goods games. *PLoS ONE*, 16(4), e0249217.
- Hardin, G. (1968). The Tragedy of the Commons. *Science*, 162(3859), pp. 1243–1248.
- Harrison, G. W. (2007). House money effects in public good experiments: Comment. *Experimental Economics*, 10(4), pp. 429-438.
- Harrison, F., & El Mouden, C. (2011). Exploring the Effects of Working for Endowments on Behaviour in Standard Economic Games. *PLoS ONE*, 6(11), e27623.
- Heitzig, J., Lessmann, K., & Zou, Y. (2011). Self-enforcing strategies to deter free-riding in the climate change mitigation game and other repeated public good games. *Proceedings of the National Academy of Sciences*. 108(38), pp. 15739-15744.
- Hossain, T., & List, J. A. (2012). The Behavioralist Visits the Factory: Increasing Productivity Using Simple Framing Manipulations. *Management Science*, 58(12), pp. 2151–2167.

- Imas, A., Sadoff, S. & Samek, A. (2016). Do People Anticipate Loss Aversion?. *Management Science*, 63(5), pp. 1271-1284.
- Isaac, R. M., & Walker, J. M. (1988). Communication and free-riding behavior: The voluntary contribution mechanism. *Economic Inquiry*, 26(4), pp. 585-608.
- Jing, L., & Cheo, R. (2013). House money effects, risk preferences and the public goods game. *Economics Letters*, 120(2), pp. 3310-313.
- Johnson, T., Dawes, C., Fowler, J., & Smirnov, O. (2020). Slowing COVID-19 transmission as a social dilemma: Lessons for government officials from interdisciplinary research on cooperation. *Journal of Behavioral Public Administration*, 3(1).
- Kahneman, D. & Tversky, A. (1979). An analysis of decision under risk. *Econometrica*, 47(2), pp. 3263-3292.
- Kosfeld, M., Okada, A., & Riedl, A. (2009). Institution formation in public goods games. *American Economic Review*, 99(4), pp. 1335-1355.
- Ledyard, J. (1995). Public Goods: A Survey of Experimental Research. *The Handbook of Experimental Economics*, pp. 111-194.
- Lönnqvist, J.-E., Verkasalo, M., Walkowity, G., & Wichardt, P. (2015). Measuring individual risk attitudes in the lab: Task or ask? An empirical comparison. *Journal of Economic Behavior and Organization*, 119, pp. 254-266.
- McEvoy, D. M. (2016). Loss aversion and student achievement. *Economics Bulletin*, 36(3), pp. 1762-1770.
- Milinski, M., Sommerfeld, R. D., Krambeck, H. J., Reed, F. A., & Marotzke, J. (2008). The collective-risk social dilemma and the prevention of simulated dangerous climate change. *Proceedings of the National Academy of Sciences*, 105(7), pp. 2291-2294.
- Muehlbacher, S., & Kirchler, E. (2009). Origin of endowments in public good games: The impact of effort on contributions. *Journal of Neuroscience, Psychology, and Economics*, 2(1), pp. 59-67.
- Ostrom, E. (1998). A Behavioral Approach to the Rational Choice Theory of Collective Action: Presidential Address, American Political Science Association. *American Political Science Review*, 92(1), pp. 1-22.
- Oxoby, R. J., & Spraggon, J. (2013). A Clear And Present Minority: Heterogeneity In The Source Of Endowments And The Provision Of Public Goods. *Economic Inquiry*, 51(4), pp. 2071-2082.

- Rege, M., & Telle, K. (2004). The impact of social approval and framing on cooperation in public good situations. *Journal of Public Economics*, 88(7-8), pp. 1625-1644.
- Stoop, J., Noussair, C. N., & Van Soest, D. (2012). From the lab to the field: Cooperation among fishermen. *Journal of Political Economy*, 120(6), pp. 1027-1056.
- Tavoni, A., Dannenberg, A., Kallis, G., & Löschel, A. (2011). Inequality, communication, and the avoidance of disastrous climate change in a public goods game. *Proceedings of the National Academy of Sciences*, 108(29), pp. 11825-11829.