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How to Split Gains and Losses? Experimental Evidence of Dictator and Ultimatum Games

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Abstract: Previous research has typically focused on distribution problems that emerge in the domain of gains. Only a few studies have distinguished between games played in the domain of gains from games in the domain of losses, even though, for example, prospect theory predicts differences between behavior in both domains. In this study, we experimentally analyze players' behavior in dictator and ultimatum games when they need to divide a monetary loss and then compare this to behavior when players have to divide a monetary gain. We find that players treat gains and losses differently in that they are less generous in games over losses and react differently to prior experiences. Players in the dictator game become more selfish after they have had the experience of playing an ultimatum game first.

Keywords: dictator game; ultimatum game; gains; losses; equal split; experimental economics

1. Introduction

Economists and social scientists have collected an increasing body of literature on the importance of other-regarding preferences for decision-making in various contexts [1]. A large number of studies have analyzed other-regarding behavior through transfers of scarce resources between players [2] using paradigms such as the dictator game [3,4] or the ultimatum game [5]. Usually, this research focuses on the behavior of subjects playing variants of these games in the domain of gains [6,7]. Although decision-makers are confronted with decision problems involving losses in many real-life situations, there is insufficient experimental evidence available on subjects' behavior in games played in the domain of losses.

Our paper contributes to the growing body of literature on studies of behavior in dictator and ultimatum games with two distinct extensions. Firstly, we transform both examples, a standard dictator game and a standard ultimatum game, from games over gains into games over losses and perform a between-subject comparison. Secondly, we contribute to methodological aspects. We analyze the data of players' behavior gathered from games played using a prepaid mechanism [8] to induce losses, using the direct-response method and not the strategy method (see Brandts and Charness [9] for a survey of comparisons of both methods). This allows us to draw conclusions from comparisons of our data with that of other studies. These comparisons are important for distinguishing real behavioral effects from (experimental) design artifacts. Drawing conclusions, in this regard, is important from a theoretical viewpoint as it (potentially) allows us to derive assumptions to refine or correct theories of (behavioral) decision-making in corresponding situations [10].

In addition, we believe that this is also important from a practical point of view. In many real-life situations, human beings are confronted with (monetary) losses, e.g., companies that cooperate not

only have to split gains but also losses, while resource allocations within households have to be negotiated, and physicians have to prioritize patients' treatments. In all of these situations, not only do gains need to be divided but losses too. Therefore, we analyze both—behavior in the gains domain as well as that in the domain of losses.

Several studies exist on behavior in the dictator game as well as in the ultimatum game, with both games being played over gains. The main empirical finding of these is that the observed behavior differs significantly from the theoretically predicted payoff-maximizing (subgame perfect equilibrium) behavior [6,7,11]. In dictator games, several participants give more than zero. On average, participants in the role of the dictator give about 28 percent of the pie [6], whereas the average proposer in ultimatum games offers about 40–50 percent of the pie to the responders with the result that such offers are most frequently accepted [7].

Over the last 30 years, many variables and manipulations have been studied to improve the understanding of subjects' motives and behaviors in the context of both games (see, for example, Engel [6] for a meta-study and review on dictator games and Güth and Kocher [7] for a survey of the literature on ultimatum games). Engel [6] summarized the following effects as being (very) robust in the context of dictator games: deserving recipients, dictators of old age, and non-anonymous dictators all show increases in generosity. In addition, gender, social distance, handling real money, getting a social cue, or making incentivized decisions all affect players' generosity [6].

Regarding the evidence from ultimatum games, Güth and Kocher [7] summarized that (1) responders care for both their own and the proposer's payoff (not accepting large differences favoring the proposer) and (2) proposers' decisions are guided either by fairness or by the fear of the rejection of unfair offers. As for behavior in dictator games, various parameters and methodological aspects are shown to affect behavior, e.g., demographics, social comparison, information structure, direct response vs. strategy method, or the incentive scheme.

As mentioned above, only a few studies have distinguished between games played in the domain of gains to those played in the domain of losses, even though prospect theory [12,13] predicts differences between behaviors in both domains. Based on prospect theory, one could assume that the steeper value function for losses (referred to as "loss aversion") influences decision-making when losses are involved. In addition, different risk preferences or a subject's reference point are of importance when prospect theory is applied.

However, there is a growing body of literature that distinguishes giving from taking in dictator games. This literature varies the dictator's action set by "including choices in which dictators can "take" money from the other player" (see List [14]. More precisely, including "taking" extends the (standard) action set located in the positive quadrant (referred to as "giving") with actions located in the negative quadrant (referred to as "taking"). List [14] along with Bardsley [15] found that providing the taking option reduces the number of dictators willing to transfer money and thereby, decreases the payoffs to the receivers. Korenok et al. [16] expanded this research by asking the question "is not taking the same as giving?" (p. 488) and found differences between not taking and giving. However, the received results were inconsistent with predictions of a theoretical model of warm glow (Korenok et al. [17]) and with the conventional rational choice model. In this regard, Cox et al. [18] proposed a theory that augments standard models with moral reference points and concluded that moral reference points are crucial in the decision to act generously.

In contrast to the above-mentioned studies, we compare behavior in games over gains with that in games over losses. More precisely, we compare behavior in games with an action set located in the positive quadrant with that in games with an action set located in the negative quadrant. As one consequence, both players receive a (real) loss in the negative game. This is not the case in "taking" games. Here, reducing the share of the receiver leads to a higher gain for the dictator and leads to a smaller gain for the receiver.

The main finding from reviewing the literature on ultimatum games in the loss domain was that more research is needed, because the evidence is ambiguous. For instance, Camerer et al. [19] showed

that the average offer is similar in games over losses to that in games over gains. However, higher offers and demands were shown by Buchan et al. [20]. In a study by Lusk and Hudson [21], players were shown to make more aggressive offers in games over losses. This finding was supported by Camerer et al. [19], who found a higher rate of responders' rejections in games over losses. In this regard, Neumann et al. [10] found that proposers demand less when facing losses, which results in a higher agreement rate.

One reason for the lack of evidence on behavior in games over losses may be that it is difficult to implement losses in a laboratory experiment. For ethical reasons, to avoid negative reputation effects and to overcome selection effects, participants in experiments that involve losses have to be compensated for both—their participation and their (possible) loss [10]. Typically, experiments use an "on-the-spot-mechanism" [8] to provide the compensation. Due to "mental accounting" and the "house-money effect," an on-the-spot-mechanism for implementing losses may mean that the participants do not perceive these losses as real (monetary) losses. Using a prepaid mechanism (which means that the compensation is paid several days prior to the experiment) has been shown to be effective in overcoming the house-money effect and ensures that participants perceive the losses to be real [8].

However, the existing literature provides different approaches to implementing losses in experiments. One approach is to introduce a waiting time [22–24]. That is, instead of losing money, subjects have to wait for a certain amount of time (that corresponds to the degree of their loss) in an experimental cabin [10,24]. However, using waiting time has its drawbacks, e.g., research in psychology suggests that subjects do not treat time and money in the same fashion [25–27]. An alternative approach is that of the cold pressor test (CPT) [28]. The CTP generates pain (induced by cold water) with the duration of the pain corresponding to the extent of the loss [10,28]. However, even this approach has its drawbacks. In particular, the CTP does not allow for the comparison of behavior in the gains domain with that in the loss domain.

The current study analyzes the experimental data of dictator and ultimatum games over gains and losses. In total, we report the behavior of 216 participants. We also analyze the relationships of participants' personality traits and various socio-demographic variables to their decisions in the games.

The existing literature is inconsistent in explaining the connection of personality traits to economic preferences (such as risk preferences or social preferences) and their effects on decision-making (in games) [29]. In a recent study, Zhao et al. [2] reported personality traits effects in dictator games (stronger and more consistent in a taking game than in a giving game). The authors concluded that "agreeableness uniquely predicted non-taking but not giving". While focusing on giving and taking in dictator games is intended to analyze the importance of property ownership, the behavioral motives may be comparable to those in situations where either gains (comparable to giving) or losses (comparable to taking) have to be allocated. Similar results were observed by Ben-Ner et al. [30], who found a significant effect of agreeableness on the dictator's offer.

Results regarding the relationship between agreeableness and behavior in ultimatum games have been inconsistent [31]. While Hilbig et al. [32] found a (negative) significant predictive effect of agreeableness on the responders' behavior, Nguyen et al. [33] reported the relationship as not significant in terms of explaining rejection behavior.

We find that subjects behave differently whether they play a game over gains or over losses. Subjects are (1) somewhat less generous in games over losses and (2) react differently to prior experiences. While the dictators' demands increase in loss treatment, when the subjects play the dictator game after an ultimatum game (over losses), the demands remain almost unaffected by their experience in the gains treatment. The proposers' demands, however, do not (significantly) change with the experience of a previously played dictator game.

The remainder of this paper is organized as follows: Section 2 provides short reviews of two studies that are closely related to our approach. In Section 3, we describe our experimental design and

procedure as well as (some) descriptive statistics. Section 4 presents the results of our investigation, and finally, Section 5 discusses and concludes our observations.

2. Related Literature

We are aware of two previous papers on the subject of the behavioral differences of subjects in ultimatum games in the loss and gains domains which are closely related to the present one.

Lusk and Hudson [21] conducted an experiment using two versions of the standard ultimatum game, applying the direct-response method and using an on-the-spot mechanism. The results of the between-subject analysis of Lusk and Hudson showed that the proposers were less generous in the loss domain. On average, the proposers were willing to bear a loss of 4.17 USD, which was lower than the amount that they were willing to give to the responder in the positive game (5.03 USD).

Lusk and Hudson pointed out that the term "offer" has a different meaning in positive and negative treatments. In the former, offer means the amount that a player wants to give to the receiver, while in the latter, it means the amount that dictators want to keep for themselves. The authors concluded that "it would be inappropriate to directly compare offers in the two treatments" and proposed to compare the "suggested final allocation." This approach is supported by Neumann et al. [34] who studied participants' behavior in a modified ultimatum game that incorporated asymmetric strategic advantages to the detriment of the responders. The authors found that responders focused more strongly on their final outcome (in terms of breaking even) than on other motives, such as fairness considerations. This is also supported by Hennig-Schmid et al. [35] who found that behavior in ultimatum games with asymmetric outside options is attributed to preferences for outcome distributions.

Neumann et al. [10] also conducted an experiment to investigate whether there are differences in players' behavior in ultimatum games over gains as compared to behavior in games over losses. They used the strategy vector method [36], in which each player makes decisions as the proposer as well as the responder in two versions—gain and loss—of the ultimatum game (varying the treatment order), and a prepaid mechanism, where a show-up fee of 10 EUR was paid two weeks prior to the experiment.

The results of Neumann et al. confirmed those of Lusk and Hudson—players treat gains and losses differently. However, in contrast to Lusk and Hudson, Neumann et al. found that proposers behaved more generously in the negative ultimatum game, since the amount of loss they were willing to bear in the negative game (4.41 EUR) was higher than the amount they were willing to give to the responder in the positive game (4.16 EUR).

The reasons for this discrepancy may relate to differences in the experimental designs, i.e., direct response method vs. strategy vector method or to the different implementations of losses (on-the-spot vs. prepaid).

We are aware of one other study that focused on the behavioral differences of subjects in dictator games over gains and losses. Baquero et al. [37] reported that "dictators are hardly affected by the gain/loss context." The authors found a small but significant generosity effect, where dictators were more generous in the loss game. The major distinction between the current study and the one of Baquero et al. [37] is that the latter used a strategy method, while the former did not.

3. Design, Procedure, and Descriptive Statistics

In this section, we describe the experimental procedure, our treatments, and background variables. In addition, we provide the related descriptive statistics.

3.1. Experimental Procedure

Experiments were conducted at the University of Leipzig and the University of Magdeburg (with about half of the participants coming from each location). In total, we recruited 216 participants (116 at the University of Leipzig and 100 at the University of Magdeburg) using hroot [38]. The games were implemented with z-Tree [39]. One hundred and three subjects participated in the gains treatments

and 113 in the loss treatments. No participant attended more than one treatment (with no more than one session per subject). At the beginning of the experiment, we informed the participants that the experiment consisted of different parts. However, the specific instructions for each part were given separately to the participants (at the beginning of each part).

All participants received a show-up fee of 5 EUR. Participants playing the dictator and/or the proposer in the gains treatments were given an additional 10 EUR (for each game separately).

For the implementation of losses, we used a prepaid mechanism. Due to the use of this mechanism, the sessions of the losses treatments consisted of two sub-sessions. The first sub-session took place two weeks prior to the second sub-session. All participants (assigned to participate in a loss treatment) received an additional show-up fee of 20 EUR and signed a receipt to confirm payment. Participants were informed (and have confirmed) that this payment could decrease during the second sub-session of the experiment and that they may have to pay money back in the event of the latter. They were also informed that they had to give back the 22 EUR if they did not participate in the second sub-session (those participants who did not attend the second sub-session could withhold 3 EUR for their participation in sub-session one). In total, 5 participants did not appear for the second sub-session. We did not have any problems concerning the repayment.

3.2. Treatments (Gains vs. Losses)

All participants played a version of a dictator game (formulated as a giving game) and an ultimatum game (see Tables 1 and 2). About half of the participants played the games in the gains domain; the other half in the loss domain. Within these two groups of participants, we varied the order of play so that the dictator game was played the first half of the time and the ultimatum game second, and vice versa in the other half (Table 3 shows the four treatments).

Table 1. Dictator game in the gains and loss domains.

		Payoffs	
		Dictator	**Receiver**
Domain	Gains	$10 - x$	x
	Loss	$-10 + x$	$-x$

Table 2. Ultimatum game in the gains and loss domains.

		Payoffs, If Responder			
		Accepts the Offer		Rejects the Offer	
		Proposer	**Responder**	**Proposer**	**Responder**
Domain	Gains	$10 - x$	x	0	
	Loss	$-10 + x$	$-x$	-10	-10

Table 3. Structure of experimental treatments.

		Task Order	
		DG First	**UG First**
Domain	Gains	T1	T2
	Loss	T3	T4

Definitions: DG is defined as Dictator Game and UG is defined as Ultimatum Game.

3.2.1. Gains Treatments

In the gains treatments (Treatment 1 (T1): dictator game first, ultimatum game second; Treatment 2 (T2): ultimatum game first, dictator game second), each participant played both games.

In T1, each participant was randomly assigned to play the dictator game either as the dictator or as the receiver. As the dictator, the players received an endowment of 10 EUR and had to decide how much of the endowment they wanted to give to the receiver.

Afterwards, the players were randomly assigned to play the ultimatum game either as the proposer or as the responder. Note that the counterparts in the second game were also re-matched (randomly). As the proposer, the players received an (additional) endowment of 10 EUR and had to suggest an allocation of the endowment. The responder decided whether to accept or reject this offer. If the responder rejected the offer, both players received nothing; otherwise, the offered allocation was paid. T2 was designed accordingly, with the changed order of playing the games. Table 4 (Table 5) shows the dictators' demands (proposers' demands) in Treatments 1 and 2.

Table 4. Comparison of dictators' demands in gains treatments.

No. of Dictators Who Demand	Classified As	T1 (n = 25)	T2 (n = 26)
(100%)	Egoist	6	4
(99%; 80%)	Rather egoistic	1	1
(79%; 70%)	(Empirical) Average	1	4
(69%; 51%)	Rather altruistic	7	2
(50%)	Equal split	8	14
(49%; 0%)	Altruist	2	1
Average demand (in EUR)		6.44	6.23
Standard deviation (in EUR)		2.46	2.10

Table 5. Comparison of proposers' demands in gains treatments.

No. of Proposers Who Demand	T1 (n = 24)	T2 (n = 26)
More than 50%	11	7
Exact 50%	12	19
Less than 50%	1	0
Average demand (in EUR)	5.31	5.33
Standard deviation (in EUR)	1.11	0.64

The proposers' demands correspond to the share of the gain each proposer wants to withhold.

One can see that the order of playing the games slightly affected the average dictator's demand. The dictators behaved (somewhat) less selfishly when the dictator game was played after the ultimatum game. This is contrary to findings reported by Takezawa et al. [40], who found more selfish behavior when the dictator game was played after the ultimatum game. The authors attribute this to a contrast effect (meaning that the experience of playing the ultimatum game first highlighted the bargaining power of the dictator) [40]. Additionally, we found that the effect of playing the ultimatum game first was to increase the number of equal split offers in the dictator game. This effect seems to be counterintuitive but may be due to reciprocity. However, the described effects were not statistically significant.

The descriptive analyses regarding the ultimatum game behavior show that the average proposers' demands remained almost unchanged. Playing the dictator game first decreased the number of equal splits in the ultimatum game. Again, both effects were not statistically significant. We did not observe rejections in the positive ultimatum games.

3.2.2. Loss Treatments

We designed the loss treatments to be as similar as possible to the gains treatments, ensuring the comparability of results. Again, we ran two different treatments (Treatment 3 (T3): dictator game first, ultimatum game second; Treatment 4 (T4): ultimatum game first, dictator game second). Subjects were recruited to participate in either T3 or T4 and played both games. They were randomly assigned to the different player roles in the games (dictator vs. receiver or proposer vs. responder).

In T3, the dictator received a loss endowment of −10 EUR and had to decide how to allocate this loss between themself and the receiver. Afterwards, when playing the ultimatum game, the randomly-assigned proposer received a (additional) loss endowment of −10 EUR and had to propose an allocation.

If the responder rejected the offer, both players incurred a loss of −10 EUR each; otherwise, the suggested allocation was realized. Again, T4 was designed accordingly, with the changed order of playing the games. Table 6 shows the dictators' demands and Table 7, the proposers' demands in Treatments 3 and 4.

Table 6. Comparison of the dictators' demands in loss treatments.

No. of Dictators Who Demand	Classified As	T3 ($n = 29$)	T4 ($n = 28$)
(100%)	Egoist	6	10
(99%; 80%)	Rather egoistic	3	3
(79%; 70%)	(Empirical) Average	3	1
(69%; 51%)	Rather altruistic	5	4
(50%)	Equal split	12	10
(49%; 0%)	Altruist	0	0
Average demand		6.72	7.40
Standard deviation		1.98	2.28

The dictators' demands correspond to the amount of loss reduction each dictator wants to secure (that is, equal to the share of the loss he/she was willing to give to the receiver).

Table 7. Comparison of proposers' demands in loss treatments.

No. of Proposers Who Demand	T3 ($n = 27$)	T4 ($n = 28$)
More than 50%	8	8
Exactly 50%	18	20
Less than 50%	1	0
Average demand	5.35	5.71
Standard deviation	0.74	1.37

One can see that the behavioral effects in the loss treatments were different from those in the gains treatments. Playing the dictator game second increased the average dictator's demand, meaning that the dictator was willing to bear a lower share of the loss, i.e., he/she became more selfish. This behavior could be attributed to a contrast effect, as reported by Takezawa et al. [40] and supported by the increasing number of completely selfish dictators and the decreasing number of equal splits. However, these effects were not statistically significant.

The descriptive analyses regarding the ultimatum game behavior revealed almost unchanged behavior among the proposers, with slightly increased average proposers' demands. Again, this effect was not statistically significant. We observed four rejections in the negative ultimatum games: one rejection of an "unfair" offer in T3 (the proposer wanted to pass along 70 percent of the loss to the responder, and three rejections of "unfair" offers in T4 (here, the proposers wanted to pass along 100%, 95%, and 60% of the loss). Figure 1 (Figure 2) summarizes the average dictator demands (average proposer demands) in all treatments (corresponding histograms are provided in Appendix A).
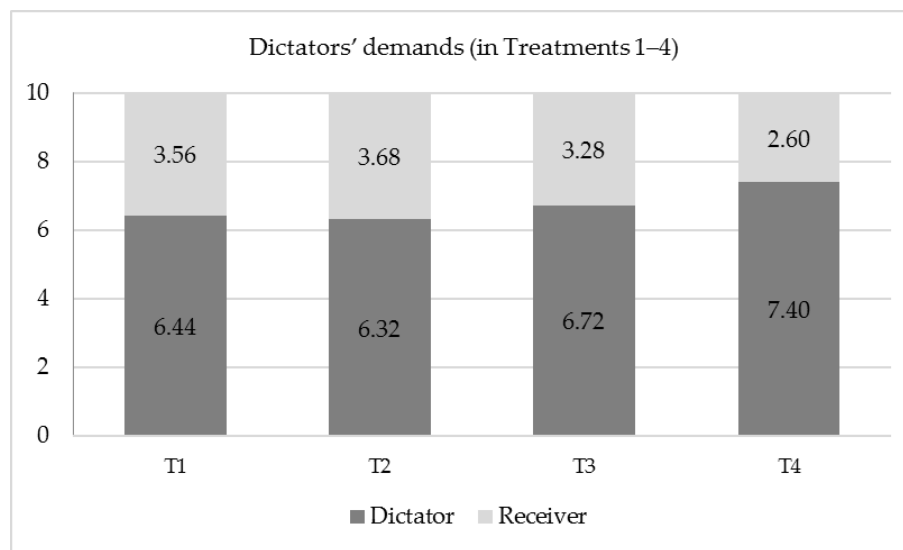
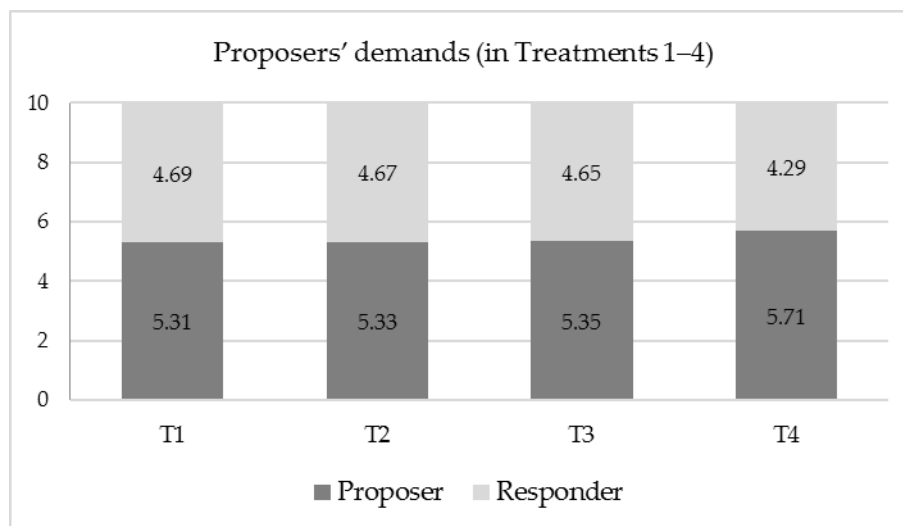**Figure 1.** Dictators' demands in all treatments.

Figure 2. Proposers' demands in all treatments.

3.3. Personality Traits and Socio-Demographics

Besides the decisions in the games, we investigated the effects of personality traits and other socio-demographic variables (e.g., age, sex, education). We then used a self-administered questionnaire to collect data about socio-demographic characteristics. Additionally, we used the 10 Item Big Five Inventory (BFI-10) [41] to measure participants' personality traits. The BFI-10 is a short form of the Big Five Inventory [42], which measures the "Big-Five" personality traits (extraversion, agreeableness, conscientiousness, neuroticism, and openness) with two items per dimension [41]. Table 8 shows the descriptive statistics regarding the personality traits of 216 participants.

Table 8. Descriptive statistics regarding personality traits.

Big Five Dimension	N	Mean	Standard Deviation	Min–Max (1–5)
Extraversion	216	3.0879	0.9483	1–5
Agreeableness	216	3.0278	0.7228	1–4.5
Conscientiousness	216	3.3657	0.8869	1–5
Neuroticism	216	3.0671	0.8621	1–5
Openness	216	3.6898	0.9480	1–5

Participants were mostly students (about 92%) from various fields of study. The sample consisted of 122 female and 94 male participants, ranging in age from 18 to 78 (mean: 26.1; SD: 6.9).

4. Results

The following analyses focus on the question of whether there were differences in the participants' behavior in the gains treatments when compared to that in the loss treatments. In this regard, we started with an analysis of the players' demands. In the next step, we then analyzed the effect of the task order. Finally, we determined the explanatory power of personality traits and various socio-demographics.

4.1. Analyses of Players' Demands in Dictator and Ultimatum Games

We first analyzed the participants' behavior when playing the role of dictator in the gains treatment (T1) (in which the dictator game was played first), and then compared it with the dictators' behavior in the corresponding loss treatment (T3). Afterwards, we analyzed the proposers' behavior in the gains treatment (T2) and compared it with the proposers' behavior in T4 (in these treatments, the ultimatum games were played first). We found that the average demand of participants in the role of a dictator was 6.44 EUR in the gains treatment (T1), compared to 6.72 EUR in the loss treatment (T3). The difference between the players' demands, however, was not statistically significant with a small effect size (Mann–Whitney Test, $z = 0.3319$, $p = 0.3699$, $r = 0.0605$)[1] [43]. The corresponding analysis of the proposers' demands in the ultimatum game under gains (T2: 5.33 EUR) and losses (T4: 5.71 EUR) revealed that the difference between treatments was also not statistically significant with a small effect size (Mann–Whitney Test, $z = 0.5046$, $p = 0.3069$, $r = 0.1729$).

Next, we compared all dictators' demands from both gains treatments (T1 and T2: 6.38 EUR) with the dictators' demands from both loss treatments (T3 and T4: 7.06 EUR) and found a difference (Mann–Whitney Test, $z = 1.5527$, $p = 0.0603$, $r = 0.1474$), meaning that dictators demanded more in the loss treatments. The corresponding comparison of the proposers' demands revealed that this difference was not statistically significant either (Mann–Whitney Test, $z = 0.2050$, $p = 0.4188$, $r = 0.0201$).

Thirdly, we compared the participants' behavior in the games that were played second. Again, we compared the dictators' demands (now from T2 and T4) and the proposers' demands, now from T1 and T3. We found that the difference between the dictators' demands (T2: 6.32 EUR vs. T4: 7.40 EUR) was significant with a medium effect size (Mann–Whitney Test, $z = 1.7867$, $p = 0.0369$, $r = 0.2636$), meaning that the dictators demanded more in the loss treatment. However, the difference between proposers' demands (T1: 5.31 EUR vs. T3: 5.35 EUR) was not significant (Mann–Whitney Test, $z = 0.7969$, $p = 0.2127$, $r = 0.0214$).

One might argue that the (significant) main effect (dictators demand more in the loss treatment) was dependent on the money earned previously. To shed light on this issue, Table 9 provides the corresponding earnings. As can be seen, the prior earnings did not differ in the corresponding treatments (Mann–Whitney Test (T2 vs. T4), $z = 0.1729$, $p = 0.4314$, $r = 0.0327$). Therefore, we conclude that the main effect cannot be explained by the prior earnings.

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[1] According to Cohen [43], the values used to classify effect sizes as "no effect", "small", "medium" and "large" are: $0 \leq r < 0.05$ (no effect), $0.05 \leq r < 0.24$ (small effect), $0.24 \leq r < 0.37$ (medium effect) and $0.37 \leq r \leq 1$ (large effect).

Table 9. Average demands of players in the first and second games.

Role	No.	Average earnings	Role	No.	Average earnings from game 1	Average earnings from game 2
Treatment 1: Dictator game first, ultimatum game second in the gains domain						
Dictator	24	6.44	Proposer	10	6.00	4.95
			Responder	14	6.79	4.43
Receiver	24	3.56	Proposer	14	3.39	5.57
			Responder	10	3.75	5.05
Treatment 2: Ultimatum game first, dictator game second in the gains domain						
Proposer	26	5.33	Dictator	14	5.25	6.14
			Receiver	12	5.42	3.63
Responder	26	4.67	Dictator	12	4.96	6.33
			Receiver	14	4.43	3.89
Treatment 3: Dictator game first, ultimatum game second in the loss domain						
Dictator	27	6.72	Proposer	14	6.43	5.39
			Responder	13	7.31	4.69
Receiver	27	3.28	Proposer	13	5.31	3.23
			Responder	14	4.61	3.03
Treatment 4: Ultimatum game first, dictator game second in the loss domain						
Proposer	28	5.71	Dictator	14	5.79	7.18
			Receiver	14	5.64	2.36
Responder	28	4.29	Dictator	14	4.18	7.68
			Receiver	14	4.39	2.79

The corresponding regression analyses showed similar results regarding (possible) treatment effects. With respect to treatment (gains vs. loss), we found a weak effect (at a 10% level) in one of the comparisons of dictator demands. In particular, given the prior experience of playing the corresponding ultimatum game for subjects in T2 and T4, dictators in the loss domain behaved more selfishly.

We conducted separate regressions (see Tables 10 and 11) on the players' demands in the second game as a function of treatment (gain vs. loss) and prior experience (from the first game). In line with the literature, we found significant effects (at a 5% level) of prior experience on the dictators' demands in the second game as well as on the proposers' demands in the second game.

Table 10. Regression analysis of players' demands in the second game.

	Dictators' Demands (T2 and T4)	Proposers' Demands (T1 and T3)
Variable	**Model 1**	**Model 2**
Treatment ($loss = 1$)	8.6476	−0.1373
Prior experience (earnings from game 1)	0.5126 **	0.2226 **
Constant	38.9779 **	31.3067 **
N	54	51
R^2	0.1419	0.2797

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

4.2. Analyses of Personality Traits and Various Socio-Demographics

We ran regressions on the players' demands with treatment (gain vs. loss), the big five traits, and gender as independent variables. Table 11 summarizes the regression results.

The regression results for the full sample (Models 3 and 6) showed that a player's agreeableness has a statistically significant effect on the players' demands. The results indicate that more agreeable players behave less selfishly (regardless of playing the dictator or the ultimatum game). A corresponding regression with task order as an additional variable revealed no task-order effect. Overall, most measures did not display a statistically significant relationship with the players' demands. However, in most cases, the results suggest that females behave less selfishly than males, though this gender effect is not statistically significant in most models.

Table 11. OLS regression analyses of treatment (gain vs. loss), personality traits, and gender on players' demands (as share of the pie in percent).

Variable	Dictators' Demands			Proposers' Demands		
	Model 1 (T1 & T3)	Model 2 (T2 & T4)	Model 3 (Full Sample)	Model 4 (T1 & T3)	Model 5 (T2 & T4)	Model 6 (Full Sample)
Treatment (loss)	–2.4045	10.651 *	4.0092	–0.8623	2.8092	1.8081
Female	–23.405 ***	13.299 *	–6.3274	–4.5162	–3.3929	–2.8007
Openness	–7.2574 **	–1.85	–2.9452	–0.8459	1.5705	0.4078
Conscientiousness	–1.1840	–0.0233	0. 6275	1.8452	–1.1249	0.4678
Extraversion	2.5093	–1.5724	1.1362	1.0018	–1.2262	–0.1293
Agreeableness	–3.7358	–11.727 ***	–9.3528 ***	0.8639	–5.183 ***	–2.721 **
Neuroticism	5.2635	–3.8702	2.6916	2.3878	–0.0557	1.3967
Constant	101.29 ***	114.72 ***	93.70 ***	40.8 1***	73.28 ***	56.15 ***
N	54	54	108	51	54	105
R^2	0.3681	0.2879	0.1535	0.0967	0.2292	0.0860
Adj. R^2	0.2719	0.1796	0.0942	–0.0503	0.1119	0.02

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

5. Discussion and Conclusions

This study assessed whether there are differences in the behavior of subjects when playing dictator and ultimatum games over gains compared to playing these games over losses. We investigated players' demands made in four different treatments in which we (1) varied the endowment (from gain to loss) and (2) the task order. Thus, participants played both games (either under gains or under losses) but played only one (randomly selected) role per game. We additionally analyzed whether the specified demands corresponded with personality traits (Big Five) or participants' gender.

Overall, we showed that subjects treat gains and losses differently and behave somewhat more selfishly in games over losses. We further showed that players' demands in the dictator games were higher than in the ultimatum games, i.e., players were fairer in the ultimatum games than they were in the dictator games.

In more detail, we previously expected players to behave more selfishly in the dictator game over losses, particularly when the dictator game was played second. The expectation regarding the task order was based on the assumption that dictators become aware of their decision power when they play an ultimatum game first. While our expectation held true for the latter case, we also observed a difference between the dictators' demands in the former. However, this difference was not statistically significant.

One possible explanation for the dictator's behavior is that dictators are more sensitive to losses than to gains, as predicted by the prospect theory's loss aversion [12]. However, because of a contrast effect, they recognize their strategic advantage only after this has been highlighted by the experience of playing the other game, as proposed by Takezawa et al. [40].

Regarding subjects' behavior in the ultimatum game, we expected an equal split to be most frequent, regardless of the treatment design, and this expectation held true. The proposer's behavior could, according to the literature, be explained either by fairness considerations (such as inequality aversion [44,45]) or their fear of rejections (for further arguments, see Bolton and Zwick [46] and Güth et al. [47]).

Our analyses on whether personality traits predict the behavior were based on previous findings that, for example, behavior in dictator games is associated with prosocial traits [2]. We, therefore, expected the Big Five dimension of agreeableness to be predictive of behavior in the games. We found agreeableness to be negatively predictive for subjects' behaviors in the second games, meaning that a more agreeable subject behaved less selfishly in the second game.

Finally, we compared our results from the ultimatum games (under gains and under losses) with those of previous studies. In line with the results of Lusk and Hudson [21] and Neumann et al. [10] we found that subjects treat gains and losses differently. It was irrelevant, in that regard, whether the actual game was played first or second.

In summation, this study contributes to different aspects of the literature. First, we systematically compared subjects' behaviors in dictator and ultimatum games over gains and losses. Although there is a broad range of literature on the behavior in games over gains, experimental economics research on behavior in the domain of losses is sparse. With the current study, we contribute to this strand. In this regard, this contribution serves as a robustness check of previous findings. Comparing our results (from the ultimatum games) with the results of Lusk and Hudson [21] and of Neumann et al. [10] supports their summation that behavior seems to be driven by subjects' preferences for certain final outcome allocations. However, we were not able to replicate the effect of proposers being more generous in the loss domain, as was shown by Neumann et al. [10]. We found, in line with Lusk and Hudson, that proposers became less generous in the negative ultimatum game. One explanation for this may be that we used a direct response method and not the strategy vector method as was used in the experiment of Neumann et al. [10]. This explanation is supported by the comparison of dictator game behavior in the current study with the behavior reported in Baquero et al. [37].

Second, we replicated a contrast effect, as reported by Takezawa et al. [40], as one possible explanation of why the task order affected subjects' behaviors. In both the current study and one by Takazawa et al. [40], the order of games influenced the subjects' behaviors in the second game. The experience from the first game seems to highlight the strategic position of the player in the second. After the experience of playing the ultimatum game first, players became aware of their bargaining power in the dictator game. However, playing the dictator game first emphasized the bargaining power of the responders in the ultimatum game, i.e., as stated by Takezawa et al. [40] "the contrast to the dictator game has highlighted a risk of rejection of selfish offers in the ultimatum game" (p. 134).

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Appendix A. Histograms
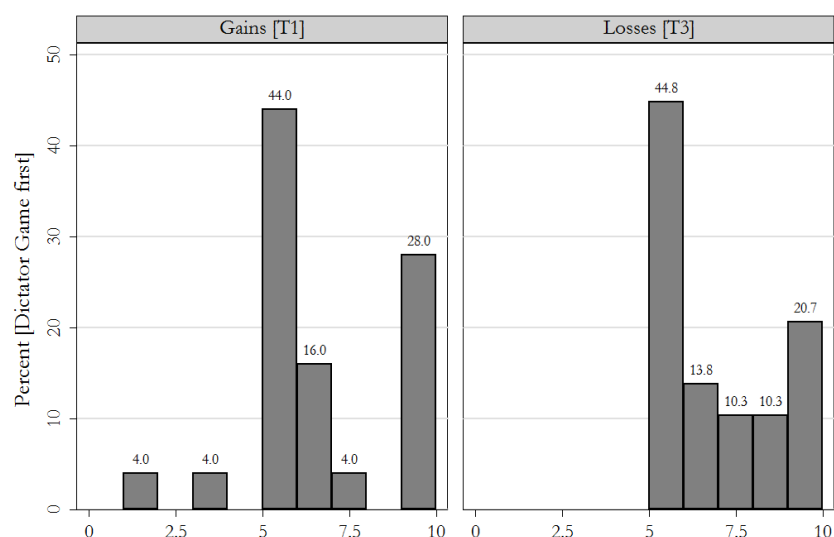
Figure A1. *Cont*.
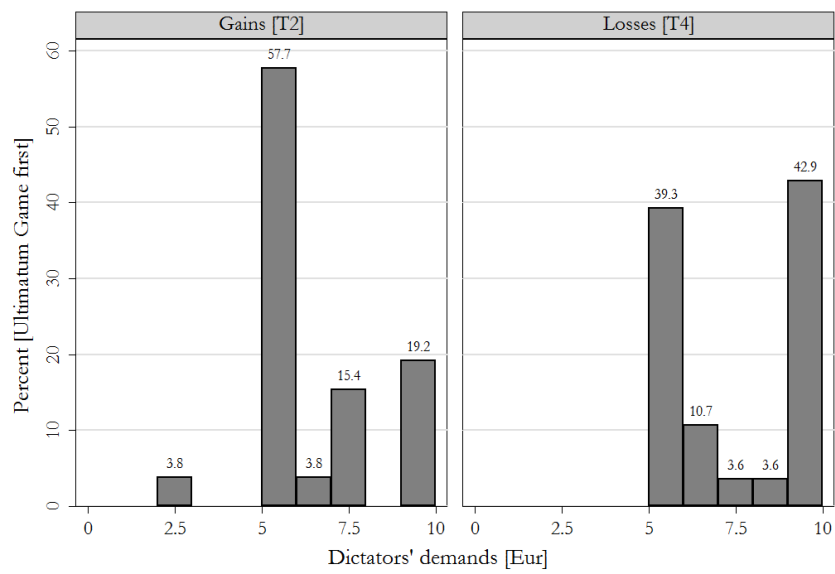
Figure A1. Histogram—dictator shares in Treatments 1–4.
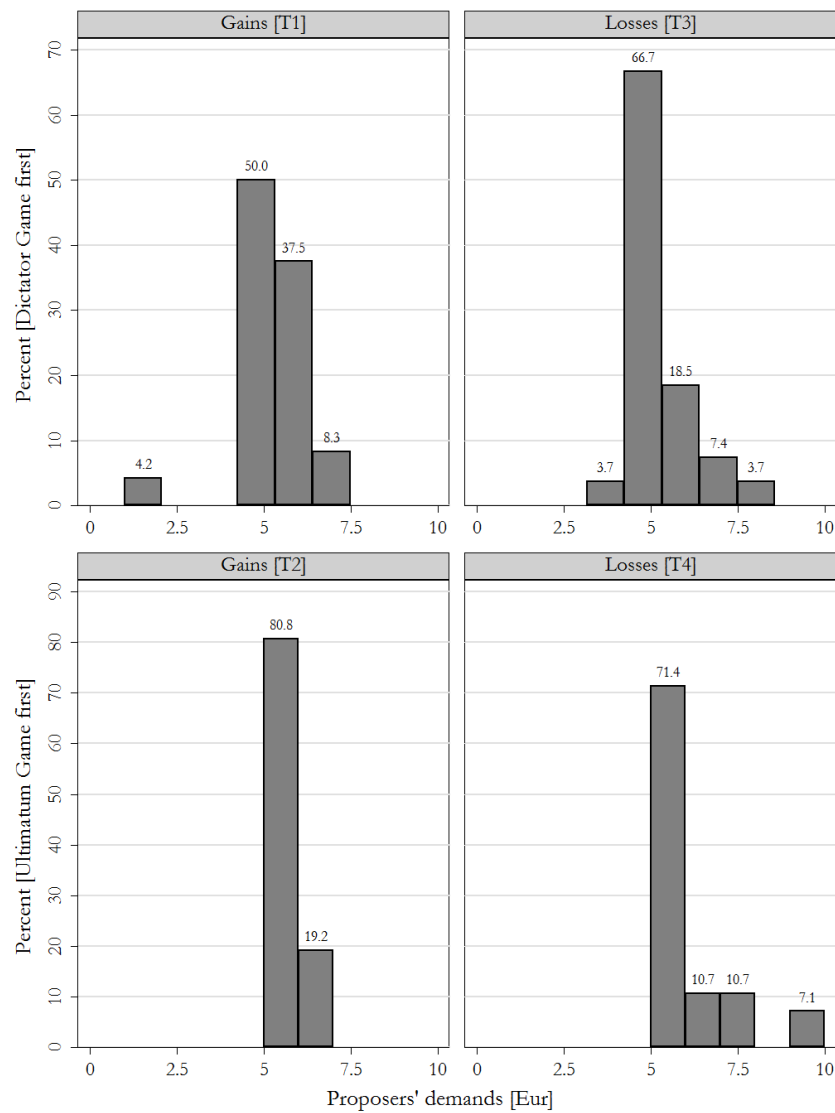
Figure A2. Histogram—proposer shares in Treatments 1–4.

Appendix B. Experimental Instructions—First Sub-Session Loss Treatment

Welcome to this experiment and thank you for your participation!

Please be quiet and don't use your mobile phones! Please read these instructions carefully. Communication between the participants is prohibited throughout the experiment. If you have any questions, please raise your hand. An experimenter will then come to your seat and answer your question in private.

This is the first of two appointments of this experiment. Today, you will receive a payment of 2500 EUR. This payment can decrease on the second appointment of the experiment. If anything prevents you from keeping the second appointment, you have to repay the payment minus 300 EUR compensation for today's appearance.

You will find a questionnaire attached. Please fill out the questionnaire in full!

Questionnaire—Personality Traits (Big5)

To measure personality traits, we used the 10-Item Big Five Inventory (BFI-10) (see Rammstedt et al. [41]).

Appendix C. Experimental Instructions—Second Sub-Session Loss Treatment

General instruction

Welcome to this experiment and thank you for your participation!

Please be quiet and don't use your mobile phones! Please read these instructions carefully. Communication between the participants is prohibited throughout the experiment. If you have any questions, please raise your hand. An experimenter will then come to your seat and answer your question in private.

You received a payment of 2500 EUR. This amount can decrease during today's experiments depending on your decisions and the decisions of other participants. In total, you will play two games over (possible) losses. Afterward, you will be asked to answer a questionnaire.

In the end, we will calculate the total loss you have to repay. This will be done in private. Hence, no other participant will get to know your final payoff.

You and the other participants will make your decisions independently from each other.

The experiment consists of two parts. You will receive separate instructions for each part.

Instruction Dictator Game

Game Description

Two participants in this experiment are randomly selected to play this part together. Player 1 receives a loss of −10 EUR. She has to split the loss between him/herself and Player 2. Player 1 chooses his/her own share of the loss (in 50 cent increments) and indicates the corresponding number.

(Screen-shot—dictator game)

Player 2 receives the difference, thus −10 EUR less than the share of Player 1. Player 1 decides independently of Player 2, who makes no decision.

Instruction Ultimatum Game

Game Description

Two participants in this experiment are randomly selected to play this part together. Player 1 has to split a loss of −10 EUR between him/herself and Player 2. Player 1 offers a distribution to Player 2. If Player 2 accepts the offer, both players will get the loss according to the selected allocation. If Player 2 rejects the offer, both players will receive a loss of −10 EUR.

Player 1 chooses her own share of the loss (in 50 cent increments) and indicates the corresponding number.

(Screen-shot—ultimatum game, proposers' decision)

The payoff for Player 2 corresponds to the difference of −10 EUR less than the share of Player 1. In the next step, Player 2 decides whether to accept or reject the offer:

(Screen-shot—ultimatum game, responders' decision)

If the offer is accepted, both players realize a loss according to the agreed allocation. If the offer is rejected, both players realize a loss of −10 EUR.

In the next step, we surveyed the socio-demographic data, e.g., gender.

Appendix D. Experimental Instructions—Gains Treatment

General Instructions

Welcome to this experiment and thank you for your participation!

Please be quiet and don't use your mobile phones! Please read these instructions carefully. Communication between the participants is prohibited throughout the experiment. If you have any

questions, please raise your hand. An experimenter will then come to your seat and answer your question in private.

You receive a show-up fee of 5 EUR for your participation. Your (final) payoff can increase depending on your and the other participants' decisions. In total, you will play two games. Afterwards, you will be asked to answer a questionnaire.

In the end, we will calculate the total gain you will receive. This will be done in private. Hence, no other participant will get to know your final payoff.

You and the other participants will make your decisions independently from each other.

The experiment consists of two parts. You will receive separate instructions for each part.

Instructions for the Dictator Game

Game Description

Two participants in this experiment are randomly selected to play this part together. Player 1 receives an amount of 10 EUR. She has to split this amount between her and Player 2. Player 1 chooses her own share of the amount (in 50 cent increments) and indicates the corresponding number:

(Screen-shot—dictator game)

Player 2 receives the difference, thus 10 EUR less than the share of Player 1. Player 1 decides independently of Player 2, who makes no decision.

Instructions for the Ultimatum Game

Game Description

Two participants in this experiment are randomly selected to play this part together. Player 1 has to split an amount of 10 EUR between her and Player 2. Player 1 offers a distribution to Player 2. If Player 2 accepts the offer, both players will receive a share of the amount according to the selected allocation. If Player 2 rejects the offer, both players will receive a payoff of 0 EUR in this part.
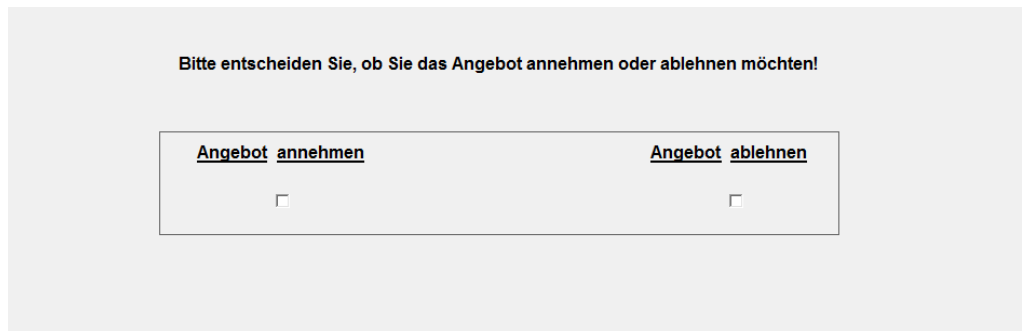
Player 1 chooses her own share of the amount (in 50 cent increments) and indicates the corresponding number:

(Screen-shot—ultimatum game, proposers' decision)

The payoff for Player 2 corresponds to the difference of 10 EUR less than the share of Player 1. In the next step, Player 2 decides whether to accept or reject the offer:

(Screen-shot—ultimatum game, responders' decision)

If the offer is accepted, both players realize a gain according to the agreed allocation. If the offer is rejected, both players receive nothing.

In the next step, we surveyed the socio-demographic data, e.g., gender.

Questionnaire—Personal Traits (Big5)

To measure personality traits, we used the 10-Item Big Five Inventory (BFI-10) (see Rammstedt et al. [41]).

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