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BOUNDED RATIONALITY IN BARGAINING GAMES: DO PROPOSERS BELIEVE THAT RESPONDERS REJECT AN EQUAL SPLIT?

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Bounded Rationality in Bargaining Games: Do Proposers Believe That Responders Reject an Equal Split?*

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Abstract

Puzzled by the experimental results of the 'impunity game' by Bolton & Zwick (1995) we replicate the game and alter it in a systematic manner. We find that although almost nobody actually rejects an offered equal split in a bargaining game, proposers behave as if there would be a considerably large rejection rate for equal splits. This result is inconsistent with existing models of economic decision making. This includes models of selfish players as well as models of social utility and reciprocity, even when combined with erroneous decision making. Our data suggests that subjects fail to foresee their opponent's decision even for one step in our simple bargaining games. We consider models of bounded rational decision making such as rules of thumb as explanations for the observed behavioral pattern.

Keywords: ultimatum game, dictator game, impunity game, social utility, bounded rationality

JEL Classification: C72, C92, D3

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1 Introduction

Bolton & Zwick (1995) test the explanatory power of the punishment hypothesis for ultimatum games. This hypothesis states that proposers choose a fair distribution of the pie because they fear that the responder will reject a more greedy offer. In order to test this hypothesis, Bolton & Zwick (1995) compared a cardinal 'impunity' game with a cardinal ultimatum game. In these games the proposer has only two choices: an unequal split ('up') and an equal split ('down'). The responder can either accept or reject the proposal. On acceptance both players get the outcome proposed by the first mover. In the ultimatum game a rejection of a proposal leads to zero payoffs for both players. In the impunity game, this is only true for a rejection of the equal split. For the unequal split, the responder can only reject his own income, while the proposer gets his share anyway (see Figure 1). In the experiment, participants encountered the games 10 times, where the sequence of h was $(1.80, 1.40, 1.00, 0.60, 0.20, 1.80, 1.40, 1.00, 0.60, 0.20)$.

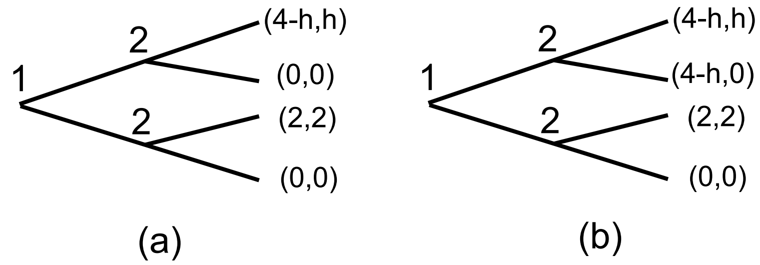

Figure 1: The ultimatum game (a) and the impunity game (b) from Bolton & Zwick (1995).

Bolton & Zwick (1995) report about 35% of standard theory equilibrium play ('up'/'up') in the ultimatum game, but 98% in the impunity game, therefore confirming the punishment hypothesis. However, the result of the impunity game is surprising in light of the usual experimental results of the dictator game, where the second player cannot reject any proposal but has to accept it. Under this condition 20-30% equilibrium play is normally observed in other experimental studies (see for instance Forsythe, Horowitz, Savin & Sefton (1994)).

One explanation for this inconsistency might lie in the asymmetry of rejection power in the impunity game, i.e. that the responder is not allowed to reject the unequal split, but has the power to reject the equal split. In a footnote Bolton & Zwick (1995) argue:

> ”We might also consider the argument that first movers desire fairness but that they opt for the higher payoff in Impunity because they fear that second movers will turn down an offer of the equal split, a risk that is not taken if the higher payoff is chosen. But we see no reason why the first mover would think that the second mover would turn down the equal split.”

In other words: It is hard to think about motives for rejecting an equal split. If the proposer anticipates this, he should think of the impunity game as a dictator game.

In a follow-up paper, Bolton, Katok & Zwick (1998) ’reconciled’ the data of the impunity game with the argument, that the outcome of (’up’/’up’) with the specified sequence of h allocates 25% of the overall pie in the experimental session to the second player, which corresponds with their observations in other dictator experiments.

In this paper, we explicitly test the relevance of asymmetric rejection power in cardinal bargaining games. Our main hypothesis, based on the argument of Bolton & Zwick (1995), is that there is no impact of the responder’s rejection power for the equal split on the proposer’s behavior. We find, that while actually responders do not reject the equal split, about 35% of the proposers behave *as if* a non-negligible share of responders would reject an equal split. This observation is inconsistent with existing economic models of behavior, including models which allow for fairness concerns, reciprocity or errors. We propose decision heuristics stemming from research on individual decision tasks and bounded rationality to explain our data.

Section 2 presents our experimental design, and Section 3 describes the procedures of the experiment. In Section 4 we analyze the data, while Section 5 discusses the results in light of theories of bounded and unbounded rational decision making, and Section 6 concludes.

2 Experimental design

We designed 5 games, which differ only in the rejection power of the responder: one dictator game, three impunity games and one ultimatum game.

The first game, Γ_1, is a replication of the original impunity by Bolton & Zwick (1995). Player 1 can decide between an equal and an unequal distribution. Player 2 may accept or reject the offer. When player 1 chooses the unequal split, player 2 can only reject his own income, but cannot diminish player 1’s outcome. When player 1 proposes the equal split, player 2 has full punishment power, and a rejection leads to zero payoffs for both. Figure 2(1) shows the extensive form of this game.

Figure 2(2) shows the cardinal dictator game, Γ_2. Player 2 has to accept player 1's offer, he has no possibility to change the distribution by choosing up or down. Although in this game the forking of the game tree is of course not necessary at the second stage, we keep it for comparability with the other figures and for similarity of the instructions in all games.

The next game, Γ_3, is a symmetric version of the original impunity game and visualized in figure 2(3). Here player 2 looses rejection power also for the equal split, i.e. if he rejects an offer, player 1 still gets his proposed share, while player 2 gets nothing.

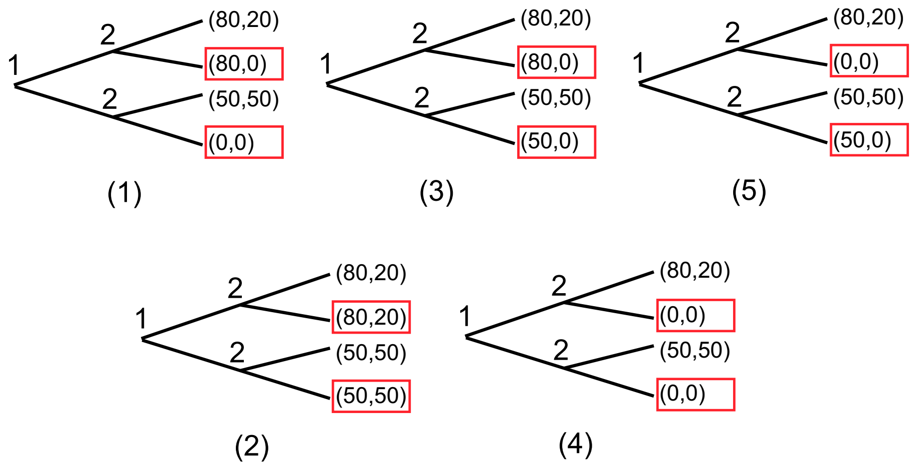

Figure 2: The 5 games: the original (asymmetric) impunity game Γ_1 (1), a dictator game Γ_2 (2), a symmetric impunity game Γ_3 (3), an ultimatum game Γ_4 (4), and a conversely asymmetric impunity game Γ_5 (5).

Figure 2(4) shows a cardinal ultimatum game, denoted as Γ_4. Player 1 can propose an equal split or an unequal split. Subsequently player 2 can either accept this offer or reject it. If player 2 accepts the offer, both get the share player 1 proposed. If player 2 rejects, both get nothing.

Last, in Γ_5 we change the asymmetric rejection power of Γ_1. Here the responding player 2 can only reject his own payoff for a proposed equal split, while he has the full rejection power if an unequal split is chosen. Figure 2(5) visualizes this.

In the remainder of this paper, we will denote the share of proposers choosing the unequal split as a_i, the share of responders accepting the unequal split as b_i, and the share of responders accepting the equal split as c_i, with $i \in \{1, 2, 3, 4, 5\}$ corresponding to the game number.

The hypothesis put forward by Bolton & Zwick (1995) implies that there is no difference in proposer's behavior in games Γ_1, Γ_2 and Γ_3. The same is true for games Γ_4 and Γ_5. The reasoning behind this hypothesis is based on the assumption that responders do not reject an equal split and that proposers rationally anticipate the responder's behavior.

Hypothesis 1

$$a_1 = a_2 = a_3 > a_4 = a_5$$
$$1 = b_1 = b_2 = b_3 > b_4 = b_5$$
$$1 = c_1 = c_2 = c_3 = c_4 = c_5$$

However, if there is an impact of the asymmetric rejection power, i.e. the fact that a responder has the possibility to reject an equal split in some games, we might observe something else. The counter hypothesis is that the share of proposers choosing 'up' is bigger in Γ_1 than in Γ_3, and bigger in Γ_4 than in Γ_5, as well as that there is no difference in proposer behavior in Γ_2 and Γ_3.

Hypothesis 2

$$a_1 > a_2 = a_3 > a_4 > a_5$$

3 Experimental Procedures

To test our hypotheses we decided to use the strategy method introduced by Selten (1967), where subjects are asked for their decisions conditionally on (some) experimental parameters.[1] In particular, each subject had to decide for all 5 games first in the role of the proposer and then in the role of the responder. To avoid order effects in the data, the order of the 5 game forms was random for both roles. To present the game in the instructions and decision forms we used a box representation similar to Bolton & Zwick (1995). Particulary, participants saw the box graph printed in Table 1. Participant A in the role of the proposer first chooses 'up' or 'down', then participant B in the role of the responder chooses 'left' or 'right'. To avoid biases the position of the standard game theoretical equilibrium (unequal split/accept) rotated within the games. In Γ_1 it was located at the lower right corner, in Γ_3 in the upper right, in Γ_4 in the upper left and in Γ_5 in the lower left corner. Γ_2 was presented as game Γ_4.

[1]For a discussion and test of the appropriateness of the strategy method for studying bargaining behavior see Brandts & Charness (2000).

In all games, the size of the pie was 8 Euro, i.e. the proposers had always to decide between an unequal split of (6.40,1.60) and an equal split of (4.00,4.00). Translation of directions, instructions, and questionnaires can be found in the Appendix.

	left	right
up	Participant A gets: XX Euro Participant B gets: XX Euro	Participant A gets: XX Euro Participant B gets: XX Euro
down	Participant A gets: XX Euro Participant B gets: XX Euro	Participant A gets: XX Euro Participant B gets: XX Euro

Table 1: The box representation on the decision forms

We also asked participants for their expectation what the majority of all other subjects may choose in the same game and role. To avoid incentive incompatibilities, we did not provide monetary incentives for right guesses.[2] However, asking for expectations should force subjects to think about opponent choices.

The experiment was conducted in April 2003 in the foyer of the student's restaurant at the University of Jena, Germany. Figure 3 shows a graph of the physical setup of the experimental session. Participants were volunteers who were recruited by leaflets and oral communication by an experimenter (denoted as '!' in the figure) at the entrance of the restaurant. They were asked to participate at an experiment with monetary reward performed on the spot.

First, a student who wanted to play had to give her name and address to experimenter 'i'. She received a code card and a form asking for gender, age, field of study, and semester, and was guided to a free table at the wall. After having filled in the personal data form she received the instructions. She was informed that it is forbidden to communicate with other people during the experiment except the experimenter 'X' for asking questions. At the end of the instructions the subject had to answer a questionnaire testing for proper understanding. When the questionnaire was filled in correctly, she received the ten randomly ordered decision forms. The subject was asked to fill in the forms subsequently from top to bottom.

Having completed the forms, the subject kept her code card, put the decision forms back into the envelope and put the envelope in a box. She was informed that she can receive her money about 30-40 minutes later.[3]

[2]Particulary, providing monetary incentives for stated expectations might drive risk averse participants to hedge risks between the real game and the expectations task, e.g. in the ultimatum game Γ_4 choosing 'up' as proposer, but 'expecting' rejection for responders.

[3]Most subjects were just going to lunch in the restaurant and received their money right

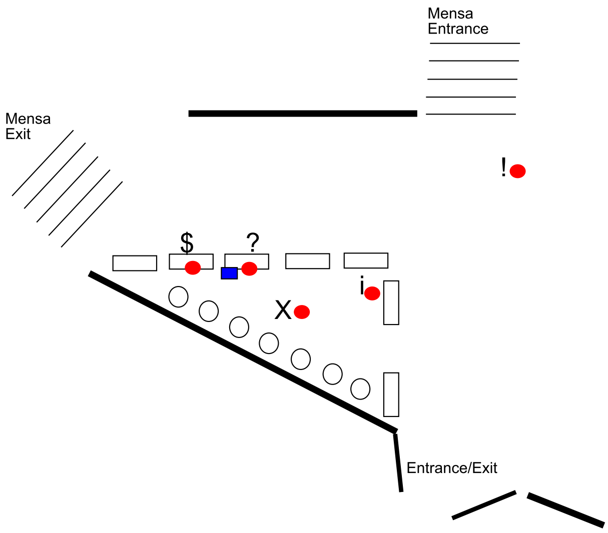

Figure 3: The organization of the experiment.

Every 30 minutes the experimenter '?' opened the box and put the collected envelopes in a second, open box. To determine payoffs, we used the following procedure:

- First, the experimenter '?' took two envelopes out of the box and placed them on the table.
- Second, he threw a 10-sided dice. If the number was odd, the first envelope represented the proposer and the second envelope the responder, and vice versa for an odd number.
- If the number was 1 or 2, game Γ_1 was chosen for the determination of payoffs, if it was 3 or 4, Γ_2 was chosen, and Γ_3, Γ_4, and Γ_5 for 5 or 6, 7 or 8, and 9 or 10, respectively.
- Third, the experimenter '?' opened both envelopes. He took the decision forms corresponding to game and role selected and calculated the payoffs. Then, he wrote down code, game number, role, and the opponent's decision on a payoff form and handed it over to the experimenter '$' handling the payoffs.
- This procedure was repeated until no more envelopes were in the open box.

after.

A participant coming back showed her code card and received the payoff form and money. She had to sign a receipt for the money earned.

Overall, the session lasted 310 minutes. 152 subjects participated. Five participants did not show up to receive their payoff. The remaining 147 subjects earned an average payoff of 3.74 Euro. They needed on average 12 to 15 minutes to read the instructions, answer the questionnaire and fill in the forms.

4 Experimental Results

For the data analysis we excluded the five participants who did not show up to receive their payoff as well as 2 participants who did not fill in the decision forms completely. Thus the analysis relies on 145 independent observations. First we will analyze proposer behavior and then focus on responder behavior. A detailed discussion of the results is provided in the next section.

Table 2 shows the observed frequencies of unequal split proposals and the acceptance rates for unequal and equal splits for the five games.

Game Γ_i	Γ_1 impunity 1	Γ_2 dictator	Γ_3 impunity 2	Γ_4 ultimatum	Γ_5 impunity3
a_i	0.800	0.676	0.710	0.552	0.283
b_i	0.986		0.979	0.910	0.938
c_i	1.000		0.979	0.993	0.993

Table 2: The observed frequencies of unequal split proposals (a_i) and acceptance choices for unequal (b_i) and equal (c_i) splits for the five games.

We observe 67.6% unequal split proposals in the cardinal dictator game Γ_2, compared to 55.2% in the cardinal ultimatum game Γ_4. This is consistent with the data observed in previous studies of ultimatum and dictator games. Moreover there are no big differences between the dictator game and the symmetric impunity game Γ_3, where we observe 71.0% unequal split proposals.

However, when we compare the dictator game Γ_2 and the symmetric impunity game Γ_3 with the asymmetric impunity game Γ_1, where the responder has punishment power for the equal split, we find that more people offer the unequal split in the asymmetric impunity than in the dictator/symmetric impunity game. On the other hand, a comparison of the ultimatum game Γ_4 with the asymmetric impunity game Γ_5, where the responder can only reject the unequal split, yields that in the latter only 28.3% of the proposers choose the unequal split, which is much lower than in the ultimatum game. In other words: 9% of the proposers change their choice between the asymmetric impunity game

Γ_1 and the symmetric impunity game Γ_3, and 26.9% of the proposers differentiate between the ultimatum game Γ_4 and the asymmetric impunity game Γ_5. In both cases, the only difference between games is that the responder can resp. cannot reject the equal split.

To test for significance we conducted a Cochran's Q test on the frequencies of unequal split proposals (a_i) of all five games i. A p-value of $p < 0.001$ indicates that at least one proportion differs from the others. Table 3 reports the results of pairwise McNemar tests between different a_i's. The test statistics confirm that a_1 is bigger than a_2 and a_3, that a_2 and a_3 do not differ significantly, that both are bigger than a_4 and finally that a_4 is bigger than a_5 at a significance level of 0.05 or smaller. In summary, we have to reject hypothesis 1, while we can confirm the counter hypothesis 2.

$N = 145$	Chi-Square	p
a_1 & a_2	6.881	0.009
a_1 & a_3	4.364	0.037
a_2 & a_3	0.457	0.499
a_2 & a_4	6.283	0.012
a_3 & a_4	9.878	0.002
a_4 & a_5	25.333	0.000

Table 3: Test statistics for pairwise McNemar tests on the share of unequal split proposals, a_i.

The share of acceptance of the unequal split, b_i, is quite high for all games i. In the games with full rejection power for the unequal split we have a rejection rate of 9% and 6.2% in Γ_4 and Γ_5, respectively, while we have a minimal rejection rate of 1.4% and 2.1% in the games where the responder can only reject his own share of the unequal split, Γ_1 and Γ_3, respectively. Pairwise McNemar tests show that b_4 is smaller than b_1 and b_3 ($p < 0.01$ for both comparisons), and b_5 is smaller than b_1 ($p = 0.039$). On the other hand, b_4 is not different from b_5, and b_1 is not different from b_3 (with $p = 0.344$ and $p = 1.000$, respectively).

Regarding the acceptance rate of the equal split, c_i, we cannot find any significant difference between the c_i's (Cochran's Q test, $p = 0.223$). In Γ_1 every subject accepted the equal split, and in Γ_3, Γ_4 and Γ_5 only 3, 1 and 1 subjects out of 145 participants rejected the equal split, respectively.[4]

[4] Regarding expectations, we have to report that most people guessed right when asked which choice the majority of all other participants would choose. However, this data does not contribute to the analysis of decisions, since we did not provide monetary incentives and asked a different question here.

5 Discussion

Our results show that although almost no responder rejects an equal split, the fact that rejection power for the equal split does exist or does not exist has an influence on the proposer's decision. We will start analyzing the games and observed behavior assuming rational players with stable preferences between games. Rationality is understood here as the ability to calculate and maximize (expected) utility and the use of it. First we discuss the responder's choice (1), next we study proposer's behavior (2).

ad.1 We cannot imagine a reasonable deterministic model of the proposer about the responder, which would predict that responders reject an equal split. Models of this kind include the assumption of selfish players as well as social utility models like Fehr & Schmidt (1999), Bolton & Ockenfels (2000) or Andreoni, Castillo & Petrie (2003)'s 'regular' preferences. In models of reciprocity as Rabin (1993) and Dufwenberg & Kirchsteiger (forthcoming) it could be possible that responders reject an equal split, particulary if the equal split is the worst outcome of all proposals from the responder's view and therefore perceived as 'unkind'. However, in our games the equal split is always the best outcome for the responder and therefore should not be rejected due to reciprocity.

In probabilistic models proposers may assume that responders have some propensities to err. That means, that some responders might reject an equal split.

ad.2 When proposers have a deterministic model about their responders, they should make no difference between a game where there is rejection power for the equal split and a game where rejection for the equal split is not feasible.

However, things may be different when the proposer thinks that the responder might err. An egoistic proposer does not care about errors in responses to proposals of the equal split in a game with no rejection power for the unequal split, as in our games Γ_1, Γ_2 and Γ_3, because he will always choose the unequal split maximizing his income. To prefer the equal split in Γ_5 while choosing the unequal split in Γ_4 the egoistic proposer's subjective probability that the responder makes an error has to be at least 37.5%.[5]

[5]The simple error model we use here states that the egoistic proposer expects the egoistic responder to deviate from his optimal decision with some probability. To derive the number above, we assume that the expected error in the response to the equal split is the same as the

Fair proposers assuming egoistic or fair responders might even differentiate between games Γ_1 and Γ_3. In a (hypothetical) model based on a fairness utility function, where players expect that others may make errors, there exist equilibria stating that proposers who are nearly indifferent but slightly fair in the symmetric impunity game Γ_3 might choose the unequal split in the asymmetric impunity game Γ_1, because they fear an erroneous punishment to the equal split. The same holds true for Γ_4 and Γ_5. However, these equilibria only exist either for a marginal share of the proposer population (the ones who are nearly indifferent) or for a relatively high expected error rate.

In game theoretical equilibria, (subjective) beliefs and observed decisions must correspond to each other, i.e beliefs must be right. In our experiments (almost) all responders accept the equal split proposal, and the share of participants differentiating between games with and without rejection power for the equal split is about 35%. Thus, our data cannot be covered by a model of rational players with propensities to err. Weizsäcker (2003) observes incorrectness of beliefs about other player's rationality and propensities to err in normal form games.

To sum up, our data is inconsistent with existing economic models assuming rational decision makers that incorporate concerns for fairness or that allow for errors. Thus our results call for alternative explanations. Experiments in economics and psychology have shown that subjects often fail to deliberate about other players' strategy spaces, especially if backward induction is involved. Bargaining games are the simplest form of backward induction experiments. It may be true that even in our experiments participants do not think thoroughly about the strategic properties of the game. They don't play a game against rational human opponents, they play a game against 'nature'.

In this context, it might be useful to look at individual decision theory. While standard game theory assumes fully rational, not 'nature-like' human co-players, individual decision theory knows the opponent called 'nature', which acts independently of a players choice and may give unexpected answers. In individual decision theory some heuristics were proposed to deal with uncertainty about nature's moves. One of these is the 'maximin' rule (Wald 1950), i.e. choosing the strategy which guarantees the decision maker the maximal

the expected error in the response to the unequal split. Then we calculate the expected error rate for the unequal split in Γ_5 which sets an egoistic proposer indifferent to the certain equal split.

payoff minimum.[6] In our extensive form game world, playing the 'maximin' strategy might mean that players ignore the (subjective) probability of rejecting the equal split, and just have an additional preference component for certain outcomes. That is, players 'normalize' the extensive form of the game, and see the opponent as 'nature'. When combined with social utility, such model of (bounded rational) decision making is capable to explain our data.

However, there might be other explanations of observed behavior. One is, that 'having the last word', i.e being the player who makes the last decisive move, has some worth to experimental subjects. Another explanation might be an item-wise comparison of alternatives. In the ultimatum game Γ_4, for instance, an offer of an equal split is 'fair', and the unequal split is 'not fair'. But choosing 'up' might yield a 'higher income', and choosing down a 'lower income'. In the asymmetric impunity game Γ_5, there is an additional item that the personal outcome of choosing 'down' is 'certain', and the outcome of choosing 'up' is 'uncertain' to some extent.[7]

Another, very simple related hypothesis is that participants simply compute unweighted averages over outcomes. Then, in the ultimatum game Γ_4 the proposer has to decide between an average of (40,10) when choosing 'up' and (25,25) when choosing 'down', but when confronted with the asymmetric impunity game Γ_5, the choice is between (40,10) for 'up' and (50,25) for 'down'. Fairness utility functions with a preference order of $u(50,25) > u(80,10) > u(25,25)$ or $u(50,25) > u(40,10) > (25,25)$ are easy to find. Figure 4 gives the complete picture.

Indeed, this explanation is also related to the (hypothetical) fairness plus errors model of decision making mentioned above. The averaging rule of thumb is equivalent to expecting a 50% error in the responder's choice. But explanations stemming from the assumption of bounded rationality do not require stable equilibria. Here, players simply ignore the strategic aspects of the game.

The resulting advice which we can give to bargainers who find themselves as a responder in an ultimatum situation is that it is not only important to communicate to the proposer that one will *reject an unfair offer*, but also to make clear that one will *accept the fair one.*

[6] As von Neumann & Morgenstern (1944) have shown, for normal form strictly competitive games, to which sequential bargaining games do *not* belong, playing 'maximin' strategies corresponds to the mixed strategy Nash equilibrium.

[7] For similar and other decision heuristics see Gigerenzer, Todd & the ABC Research Group (1999).

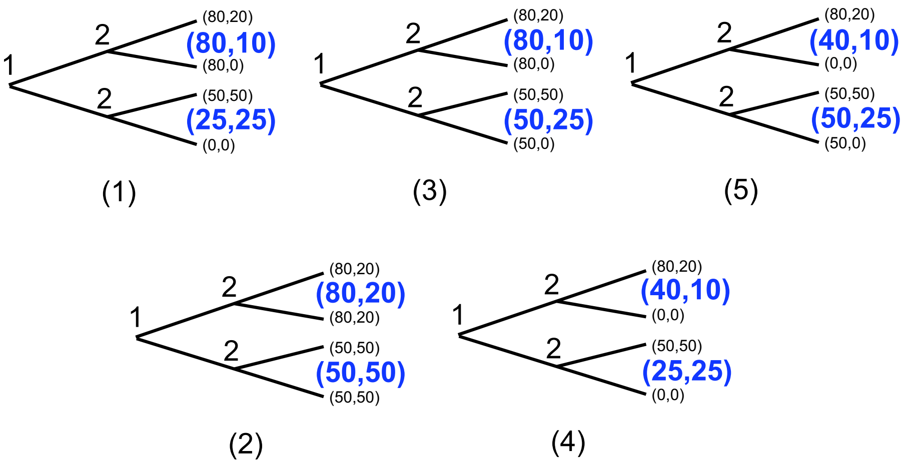

Figure 4: The averaging outcome for the 5 games: asymmetric impunity game Γ_1 (1), dictator game Γ_2 (2), symmetric impunity game Γ_3 (3), ultimatum game Γ_4 (4), and conversely asymmetric impunity game Γ_5 (5).

6 Conclusions

To test for the impact of asymmetric rejection power in bargaining games we replicated the 'impunity' game of Bolton & Zwick (1995) and altered it in a systematic manner. We find that although almost no responder actually rejects an offered equal split in a bargaining game, proposers behave as if there would be a considerably large rejection rate for equal splits. This result cannot be explained by existing models of economic behavior. Particulary, standard game theory as well as models of fairness and reciprocity, even when combined with erroneous decision making, are inconsistent with our data. Our results suggest that subjects fail to foresee their opponent's decision even for one step in our simple bargaining games. We consider models of bounded rationalistic decision making such as rules of thumb as explanations for the observed behavioral pattern.

Further research might be devoted to explicitly measure beliefs of players about their actual opponent's behavior in the games studied here, since our data does not allow to check for these. Results from such experiments should indicate whether proposers form wrong beliefs or simply ignore strategic aspects in bargaining, that is ignoring their beliefs to (rationally) make their own decision.

Other experimental designs to differentiate between explanations based on bounded rationality might be feasible. As another extension, a repetition of the games conducted in the experiment might indicate if subjects learn to perceive the games in a strategic context.

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A Instructions and decision forms

A.1 Personal Data Form

Personal Data Form, Code: AIZ-637-S77

Gender: .... male .... female

Main field of studies: ....

Semester (including the current): ....

Age: ...... years

A.2 Instructions

Instructions Code: AIZ-637-S77

Welcome to this experiment conducted by the Max Planck Institute for Research into Economic Systems, Jena. Please read these instructions carefully and answer the understanding questions at the end of the instructions. Signal the experimenter when you have finished.

During the experiment it is not allowed to communicate with other persons but the experimenters. You have to fill in the forms completely. If you do not behave according to these rules, we will have to exclude you from the payoffs.

This experiment consists of 5 different situations. In each situation 2 participants interact with each other: Participant A and Participant B. In each situation both participants see an arrangement of 4 boxes. In each box the monetary payment for Participant A and the monetary payment for Participant B are given. This might serve as an example:

	left	right
up	Participant A gets: .. Euro Participant B gets: .. Euro	Participant A gets: .. Euro Participant B gets: .. Euro
down	Participant A gets: .. Euro Participant B gets: .. Euro	Participant A gets: .. Euro Participant B gets: .. Euro

In each situation, first Participant A chooses the row. That means by choosing 'up' or 'down' he determines, if the upper or the lower row is relevant for the payment.

After knowing the choice of Participant A, Participant B chooses the column 'left' or 'right'. By this he determines which box from the row chosen by Participant A is relevant for the payoffs.

One example: Participant A chooses first. He chooses 'up'. Now, Participant B who gets to know Participant A's decision chooses between 'up/left' and 'up/right'. Participant B chooses 'left'. As a result, both Participant A and B get their corresponding payoff noted in the upper left box.

In this experiment you'll have to decide in all five situations. First you will decide in all five situations in the role of Participant A. Then you will be asked for your decisions in all situations as Participant B, always for the case that Participant A has chosen 'up' and for the case that Participant A has chosen 'down'. In the end you will have filled in 5 situations x 2 roles = 10 decision forms.

For the calculations of payoffs we will randomly match pairs of 2 participants. Then we will randomly choose one situation out of the five situations, and will randomly assign the roles of the 'proposer' and 'responder' to the two participants. When situation and roles are determined, the payoff simply results from the game instructions: We take the decision forms of the two participants for the selected situation. The decision of the participant in role A determines the row, the decision of the participant in role B the column of the payoff box. The payoffs in this box will be paid out in cash.

For the random draw to allocate situation and roles we will take a 10-sided dice. We will (blindly) take two envelopes out of the box with the decision forms. Then the dice is thrown once. If the number is even, the first drawn envelope represents Participant A, and the second Participant B. If the number is uneven, roles are assigned vice versa: the first envelope is Participant B, and the second Participant A. If the number is 1 or 2, situation 1 is selected. If it is 3 or 4, the selected situation is situation 2, if the number is 5 or 6, it is situation 3, for 7 and 8 it is situation 4, and for 9 and 10 it is situation 5.

That means, that exactly one out of the 10 decision forms you filled in will be relevant for payoff.

After you answered the questionnaire printed below, you will receive the decision forms. Please fill them in from top to bottom. After having filled in everything, put the forms in the envelope and throw it in the big box. Keep the code number for yourself. You will need it to receive your payoff.

After 30-40 minutes, but at latest at 14:30 o'clock, please come back to the experiment place. In the mean time we will randomly determine pairs, situations and roles. When you show up, we will inform you about which role and situation was assigned to you and which decision the participant matched with you has taken. Then you will give us your code card, and we will immediately pay you in cash.

The identity of the participant matched with you will remain secret. Your identity will kept secret, as well, meaning that your decisions are anonymous.

If you have any questions now or later during the experiment, please raise your hand. An experimenter will come to you and answer your question privately.

A.3 Questionnaire

Questionnaire: Code: AIZ-637-S77

Imagine the following situation:

	left	right
up	Participant A gets: 4 Euro	Participant A gets: 5 Euro
	Participant B gets: 4 Euro	Participant B gets: 3 Euro
down	Participant A gets: 2 Euro	Participant A gets: 7 Euro
	Participant B gets: 6 Euro	Participant B gets: 1 Euro

1. Assume, you are Participant B. The other person, Participant A, chooses 'up'. After you get to know Participant A's decision, you choose 'right'. What is your actual payoff, if this situation is later selected for payoff?

...... Euro

2. Assume, you are Participant A, and you choose 'down'. Which of the four boxes can Participant B choose now? Please cross the box(es).

.... upper left .... lower left .... upper right .... lower right

3. Assume, you are Participant A and you choose 'down'. Then Participant B chooses 'left'. What is your payoff?

...... Euro

A.4 Decision form proposer

Decision Form Code AIZ-637-S77 Situation 5

You are Participant A. You have to choose 'up' or 'down'. Then, Participant B will choose 'right' or 'left' from the selected row.

The payoff in cash will be determined as follows:

	left	right
up	Participant A gets: 6.40 Euro	Participant A gets: 6.40 Euro
	Participant B gets: 1.60 Euro	Participant B gets: 1.60 Euro
down	Participant A gets: 4.00 Euro	Participant A gets: 4.00 Euro
	Participant B gets: 4.00 Euro	Participant B gets: 4.00 Euro

What do you choose? Please make a cross at your selection:

.... up .... down

What do you think the majority of all other participants will choose in this situation as Participant A? Please make a cross.

.... up .... down

A.5 Decision form Responder

Decision Form Code AIZ-637-S77 Situation 3

You are Participant B. Participant B has selected 'up' or 'down'. Now you have to choose 'left' or 'right' from the row selected by Participant A.

The payoff in cash will be determined as follows:

	left	right
up	Participant A gets: 6.40 Euro Participant B gets: 0.00 Euro	Participant A gets: 6.40 Euro Participant B gets: 1.60 Euro
down	Participant A gets: 4.00 Euro Participant B gets: 0.00 Euro	Participant A gets: 4.00 Euro Participant B gets: 4.00 Euro

If Participant A has selected 'up': what do you choose? Please cross your selection.

.... left .... right

What do you think the majority of all other participants will choose in this situation as Participant B? Please make a cross.

.... left .... right

If Participant A has selected 'down': what do you choose? Please cross your selection.

.... left .... right

What do you think the majority of all other participants will choose in this situation as Participant B? Please make a cross.

.... left .... right

B Data

Abbreviations: a_i: 1 - proposer chooses up in game Γ_i, 0 - proposer chooses down in game Γ_i, b_i: 1 - responder accepts unequal split in game Γ_i, 0 - responder rejects unequal split in Γ_i, 1 - responder accepts equal split in game Γ_i, 0 - responder rejects equal split in Γ_i.

Code	a_1	a_2	a_3	a_4	a_5	b_1	b_2	b_3	b_4	b_5	z_1	z_2	z_3	z_4	z_5
AIZ-637-S77	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1
AJK-936-D74	1	1	1	1	0	1	0	1	1	1	1	1	1	1	1
AJO-184-T67	0	0	1	0	0	1	0	0	0	1	1	1	0	1	1
AKJ-429-K17	1	0	1	0	0	1	0	1	1	1	1	1	1	1	1
AOW-200-E31	0	1	1	0	0	1	0	1	1	1	1	1	1	1	1
ATZ-208-Y28	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1
BFC-185-L23	1	1	1	1	0	1	0	1	1	1	1	1	1	1	1
BFT-473-Z91	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
BJP-240-H75	1	0	1	1	0	1	1	1	1	1	1	0	1	1	1
BPF-348-A26	1	0	1	0	0	1	1	1	1	1	1	1	1	1	1
BQX-615-Z11	1	1	1	1	0	1	0	1	1	1	1	1	1	1	1
BXE-992-N51	0	1	0	0	0	1	0	1	1	1	1	1	1	1	1
BZK-362-L64	0	0	1	0	0	1	1	1	1	1	1	0	1	1	1
BZS-733-T90	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1
CHC-739-Z57	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1
CJK-591-K54	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1
CMO-501-C57	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1
COI-569-E63	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1
CTG-691-E89	1	1	1	0	0	1	0	1	1	1	1	0	1	1	1
CUI-490-B80	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
DBP-462-A46	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1
DHN-830-N13	0	1	0	0	0	1	1	1	0	0	1	1	1	1	1
DHS-375-D11	1	1	0	0	0	1	1	1	1	1	1	0	1	1	1
DIW-775-J58	0	0	0	0	0	0	1	0	0	0	1	1	1	1	1
DLJ-418-H39	1	1	1	1	0	1	0	1	1	1	1	0	1	1	1
DME-755-A98	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
DTL-989-K15	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1
DYO-469-J64	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1
EEC-112-F32	1	1	0	0	0	1	1	1	0	1	1	1	1	1	1
EGJ-883-Q35	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
EHT-543-R29	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
ELY-574-Y93	1	0	1	0	1	1	0	1	1	1	1	0	1	1	1
EMG-525-G30	1	0	1	0	0	1	0	1	1	1	1	1	1	1	1
EUD-564-P55	1	0	0	0	0	1	1	1	0	1	1	1	1	1	1
EYX-572-F19	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
EZR-251-Z25	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
FFM-912-Z64	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1
FLF-680-X91	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
FNZ-641-Z41	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
FOA-709-U84	0	0	0	0	0	1	1	1	0	0	1	1	1	1	1
FOR-455-K96	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1
FPT-138-S72	0	1	0	0	1	1	0	1	1	1	1	0	1	1	1
GAH-563-Q98	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
GAJ-506-W32	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
GIT-242-C94	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
GKA-862-W15	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1
GKX-589-H25	1	1	1	0	0	1	0	1	1	1	1	1	1	1	1
GLD-617-B45	1	0	1	0	0	1	0	1	1	1	1	0	1	1	1
GMG-800-V55	1	1	1	1	0	1	0	1	0	1	1	0	1	0	0
GMX-376-F41	0	1	0	0	0	1	0	1	1	1	1	0	1	1	1
GPD-293-K66	1	1	1	0	0	1	0	1	1	1	1	0	1	1	1
GSP-479-B36	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1
GUQ-358-M17	1	0	0	1	1	1	0	1	1	1	1	0	1	1	1
GXJ-431-A73	1	1	1	1	0	1	0	1	1	1	1	0	1	1	1
HBK-300-K47	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1
HCF-439-N35	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
HHR-181-W67	0	1	0	0	1	1	0	1	1	1	1	1	1	1	1
HIY-490-N16	1	0	1	0	0	1	1	1	1	1	1	1	1	1	1
HLK-982-X13	1	0	1	1	0	1	1	1	1	1	1	0	1	1	1
HOU-439-Q60	1	0	0	0	0	1	0	1	1	1	1	0	1	1	1
IAN-957-O44	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1

Code	a_1	a_2	a_3	a_4	a_5	b_1	b_2	b_3	b_4	b_5	z_1	z_2	z_3	z_4	z_5
IBB-170-N18	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1
ICD-835-W12	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1
ICE-281-A10	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
IDB-785-R53	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1
IHF-137-H97	1	1	1	0	0	1	0	1	1	1	1	0	1	1	1
IRD-227-B21	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1
IWV-335-Q45	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1
IYH-669-Z66	0	1	1	0	0	1	1	1	1	1	1	1	1	1	1
JCC-653-V95	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
JGW-834-L45	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1
JGY-821-X46	1	0	1	0	0	1	0	1	1	1	1	0	1	1	1
JIA-766-S71	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
JRU-685-S91	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
JWK-118-S85	0	1	1	0	1	1	1	1	1	1	1	0	1	1	1
KNK-565-P62	1	1	0	1	0	1	1	1	1	1	1	0	1	1	1
KXM-613-V22	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1
LAD-796-R29	1	0	0	0	0	1	0	1	1	1	1	0	1	1	1
LAU-610-Z54	1	0	1	0	0	1	1	1	1	1	1	1	1	1	1
LIG-663-U74	0	0	0	0	0	1	0	1	1	1	1	0	1	1	1
LLK-264-C44	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1
LMF-231-T61	1	1	1	1	0	1	0	1	1	1	1	0	1	1	1
LPC-776-U66	0	1	0	0	0	0	1	1	1	1	1	1	0	1	1
LPM-468-Q13	1	0	0	0	0	1	0	1	1	1	1	0	1	1	1
LSI-309-V22	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1
LVU-595-S96	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
MQT-719-T18	1	0	1	0	0	1		1	1	1	1	0	1	1	1
MTH-611-M57	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MVR-789-A78	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1
MYD-714-O34	1	1	1	0	0	1	1	1	0	0	1	1	1	1	1
NOD-732-J10	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1
NTW-825-H20	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1
NVP-209-T94	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1
NYV-415-C55	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
OAB-840-Y20	1	1	1	1	0	1	0	1	1	1	1	1	1	1	1
OKI-243-W80	1	1	0	1	0	1	1	1	1	1	1	0	1	1	1
OMS-841-I66	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
OUL-801-A73	1	1	1	0	0	1	0	1	1	1	1	1	1	1	1
OWS-773-X15	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1
OZR-487-P78	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
OZY-580-Q33	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1
PBP-872-J98	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1
PCT-852-U18	0	0	0	1	1	1	1	1	1	1	1	0	1	1	1
PDJ-160-D67	1	0	0	1	0	1	0	1	0	1	1	0	1	1	1
PFD-387-F79	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1
PRO-378-B20	1	1	1	0	0	1	0	1	1	1	1	0	1	1	1
PRX-907-N24	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1
PUU-923-V99	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1
QAY-619-G56	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1
QES-125-N95	1	0	0	0	0	1	0	1	0	0	1	1	1	1	1
QJV-160-Y75	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1
QOY-442-E33	0	0	1	0	0	1	0	1	1	1	1	0	1	1	1
QQY-242-P69	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
QVV-431-J65	1	1	1	0	0	1	1	1	1	0	1	1	1	1	1
QWD-640-R12	1	1	1	0	0	1	1	1	0	0	1	1	1	1	1
QWF-860-A85	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1
RAI-632-Q40	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1
RGV-909-A46	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1
RJE-327-G10	1	1	1	1	0	1	0	1	1	1	1	0	1	1	1
RUH-586-V63	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1
RWY-992-F62	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RYB-378-U25	0	0	1	1	0	1	0	1	1	1	1	0	1	1	1
SBA-808-Z64	1	1	1	1	0	1	0	1	1	1	1	1	1	1	1
SFC-831-Y88	1	1	1	1	0	1	0	1	1	1	1	0	1	1	1
SFD-987-L90	1	0	0	1	0	1	0	1	1	0	1	0	1	1	1
SGW-870-T12	0	0	0	0	0	1	0	1	0	1	1	0	1	1	1
SIJ-961-R81	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
SJL-434-H61	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1
SLD-294-W96	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1
STO-467-V68	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1
SXF-480-W74	1	1	1	1	0	1	0	0	1	1	1	1	0	1	1
SZE-686-W44	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1
TNH-243-W63	0	0	1	0	0	1	0	1	1	1	1	0	1	1	1
TOO-458-D81	1	0	0	0	0	1	0	1	1	1	1	0	1	1	1

Code	a_1	a_2	a_3	a_4	a_5	b_1	b_2	b_3	b_4	b_5	z_1	z_2	z_3	z_4	z_5
TPV-433-W29	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1
TUA-150-S93	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1
UFP-638-Y34	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
UJR-726-P64	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1
UNY-473-Q20	1	0	0	1	0	1	0	1	1	1	1	0	1	1	1
URV-889-K91	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
URY-232-L57	1	1	1	1	0	1	0	1	1	1	1	0	1	1	1
VAL-234-C55	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1
VEH-134-P71	1	1	1	0	0	1	0	1	1	1	1	0	1	1	1
VET-960-Z21	1	0	1	1	1	1	1	1	1	1	1	0	1	1	1
VJZ-332-X31	1	0	1	0	0	1	0	1	1	1	1	0	1	1	1