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The Covered Response Ultimatum Game

by

KLAUS ABBINK, ABDOLKARIM SADRIEH & SHMUEL ZAMIR

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Abstract
We report an experiment comparing the covered response ultimatum game, in which proposers are not informed about the responders' reactions, to the game with informed proposers. When responses are covered we observe high rejection rates that seem to be motivated by responders' resistance to unfairness. When proposers are informed the rejection rates are even higher. The higher rate, we conjecture, results from the responders effort to create a group reputation for being "tough". High rejection rates in the open treatment effectively "educate" proposers. We conclude that both resistance to unfairness and contribution to group reputation are determinants of responder behaviour, but neither is sufficient on its own.

Keywords
Ultimatum bargaining, fairness, punishment, experimental economics

JEL Classification Codes
C78, C91, C92, D82

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Authors

Klaus Abbink	Abdolkarim Sadrieh	Shmuel Zamir
Laboratorium für experimentelle Wirtschaftsforschung Uni Bonn Adenauerallee 24-42 53113 Bonn, Germany phone: 49-228-73-9192 fax: 49-228-73-9193 abbink@lab.econ1.uni-bonn.de	Department of Economics, Tilburg University PO Box 90153, 5000 LE Tilburg, The Netherlands Phone 31-13-466-2938 fax: 31-13-466-3042 Sadrieh@kub.nl	Dept. of Statistics The Hebrew University of Jerusalem Mt. Scopus 91905 Jerusalem, Israel phone: 972-2-5883305 fax: 972-2-5825748 zamir@math.huji.ac.il

1. Introduction

In the well-known ultimatum game, one player (the *proposer*, male pronouns) offers a second player (the *responder*, female pronouns) a division of a fixed cake. The responder can either accept or reject. If she accepts, the proposed division is implemented, if she rejects, both receive nothing. The subgame perfect equilibrium is straightforward: the responder does not reject any positive offers, since even the smallest positive payoff is better than receiving zero. In anticipation of this, the proposer offers no more than the smallest money unit and the responder accepts. Hence, under the common knowledge of rationality, the proposer virtually grabs the whole cake for himself.

Subjects' behaviour, however, is different. A large experimental literature starting with GÜTH, SCHMITTBERGER, and SCHWARZE (1982) has focused on this simple bargaining game, and in almost all studies dramatic deviations from the subgame perfect prediction are observed[1]. Typically, responders do turn down small offers, and proposers offer substantial amounts of money, very often up to an equal division of the cake.

Why do responders reject when this just means leaving money on the table? Such behaviour is quite obviously not rational, if subjects are only concerned about own payoffs and the game is only played once. Thus, one approach to explain rejections in the ultimatum game is to assume that responders prefer receiving nothing to receiving little, because the rejection creates an allocation in which the proposer also receives nothing. This approach is related to a fairness argument: Responders are willing to pay the price of receiving nothing because of some inherent *resistance to unfairness* (THALER 1988).

However, it is a striking experimental observation that, although responders leave some money on the table by rejecting low offers, on average they receive greater payoffs than in subgame perfect equilibrium play. Does this mean that it is not only fairness, but some kind of monetary self-interest that drives rejection behaviour? In repeated play settings, such results are readily explained in terms of reputation building super-game strategies.[2] In the one-shot setting of typical ultimatum game experiments, however, reputation building is not possible, at least not on an individual level. Both the proposer and the responder know that they will not meet again.

While reputation on individual level cannot explain the success of responders in receiving payoffs that by far exceed the subgame perfect equilibrium prediction in the ultimatum game, perhaps reputation on group level can. If the population of responders has a *group reputation* for being "tough" (i.e. rejecting low offers), then proposers fearing rejections may increase their offers, thus driving responders' payoffs up. In this sense, the group reputation may be a

[1] Surveys on ultimatum game experiments are in GÜTH (1994), ROTH (1995), and CAMERER and THALER (1995).

[2] Reputational effects have been show to be decisive to outcomes in quite a number of experiments, for example: the *borrower-lender game* studied by CAMERER and WEIGELT (1988), the simple signalling game studied by BRANDTS and HOLT (1992), the *centipede game* studied by MCKELVEY and PALFREY (1992), and the *chain-store game* studied by JUNG, KAGEL, and LEVIN (1994).

public good for the population of responders and each individual responder can contribute to this public good by rejecting low offers. Hence, rejections in the ultimatum game may be due to some form of *population rationality,* as WINTER and ZAMIR (1996) have suggested.

The hypothesis that rejection behaviour is driven by own payoff considerations[3] is challenged by *fairness utility* models, such as presented by BOLTON (1991), RABIN (1993), BOLTON and OCKENFELS (1999), and FEHR and SCHMIDT (1999). In these models, players are concerned about their own payoff and the "fairness" of the outcome. Although fairness is modelled in different ways, the common feature is that individuals are assumed to have a disutility of unfair outcomes. Standard game theoretical methods are applied to games in which players have such modified utility (or motivation) functions. A remarkably good fit of their models' predictions to a wide range of different experimental data is reported. The players in these models, however, are concerned about fairness only in a static manner.[4] Dynamic considerations of decision making, that motivate punishment either as a response to history (reciprocity) or as an investment for future payoffs (group reputation), are not modelled.

Taking the two sides of the coin together, the fundamental open question that we address with this paper is whether responders' rejection behaviour is driven by fairness motives or by group reputation. Do responders happen to earn more because they want to reject unfair offers or do they reject unfair offers only because they want to earn more?

In this paper, we introduce the *covered response ultimatum game* which allows us to separate static from dynamic motives across treatments. The simple modification we apply to the ultimatum game is that in one treatment (the *covered response treatment*) the responder's decision is not reported to the proposer immediately, while in a second treatment (the *open response treatment*) it is. Rejections observed in the covered response treatment cannot be interpreted as contributions to group reputation, whereas the fairness utility models cannot explain differences across the two treatments. The former holds because group reputation is void in the covered response treatment, in which proposers are informed on the rejections only after the all decisions have been made in the experiment. The latter holds because there are neither strategic nor payoff differences across treatments that would allow divergent predictions by fairness utility models. The experimental results reported in this paper strongly suggest that responders behaviour is motivated both by resistance to unfairness and by contribution to group reputation, but neither explanation is sufficient on its own.

[3] Simulation paths of adaptive learning models as studied by ROTH and EREV (1995) also exhibit some of the features of ultimatum game outcomes. Since rejecting small offers causes smaller losses for the responder than for the proposer, proposers in these models learn faster not to make small offers than responders learn to accept them. ABBINK, BOLTON, SADRIEH, and TANG (1996), however, find that simple adaptive learning models do not capture responder motivations completely. They show that many responders not only care about their own payoffs, but also about the payoff received by the proposer. To incorporate more sophisticated behavioural structures, adpative learning models have been enhanced in a number of ways, e.g. EREV and ROTH (1998) and CAMERER and HO (1999).

[4] GNEEZY and STOLER (1998) show that in a one-shot situation, social punishment behaviour can be observed next to personal revenge.

2. Hypotheses

As mentioned, the covered response ultimatum game provides a qualitative test for some of the features of static fairness utility models and dynamic adaptation approaches. More specifically, this study aims at presenting a test of the following two main hypotheses:

Hypothesis 1 (Resistance to Unfairness). *Rejections are exclusively motivated by the fairness of the final outcomes. No difference in rejection rates between the covered and the open response treatment are expected.*

Hypothesis 2 (Contribution to Group Reputation). *Rejections are exclusively motivated by group reputation considerations. No rejections are expected in the covered response treatment. In the open response treatment, high rejection rates are expected in early rounds. These rates are expected to decline towards the end of the experiment, as the advantage of the group reputation diminishes.*

The hypothesis of *resistance to unfairness* captures the motivational assumptions underlying fairness utility models. In these models dynamic considerations are irrelevant. Only the fairness of the final outcome - next to the own payoff - enters players' utility or evaluation functions. Since the reponders have exactly the same choices and influence the final allocation in exactly the same way in both treatments, the distribution of final allocations should be indistinguishable in both treatments. Especially, the fact that the proposers in the covered response treatment are not informed on who punished them when should not make a difference for the choices the responders make.

The second hypothesis addresses a *group reputation* motive. Responders contribute to their group's reputation for being "tough" by punishing proposers who make unfair offers. Since a proposer faces a much greater damage after the rejection of a low offer than the rejecting responder does, proposers are likely to move towards more generous offers in the face of a "tough" group of responders. Thus, the rejection of low offers can *educate* the proposer. In a "meet only once" context, the rejection is not meant to enhance the rejecting responder's payoff immediately by educating the particular proposer for later occasions when the two meet again. Instead, educating proposers is a system of mutual contributions to a public good, namely to the group reputation. On average, each responder benefits from the group reputation, i.e. indirectly benefits from the rejections.[5]

The covered response ultimatum game separates the two hypotheses in the sense that rejections in the covered response treatment can be explained by hypothesis 1 but not by hypothesis 2. Observing more rejections in the open than in the covered response treatment, however, can be explained by hypothesis 2 but not by hypothesis 1. Our design is subtractive: In the open response treatment, both motivations might be relevant and the two hypotheses do not rule out one another. In the covered response treatment the group reputation motive is re-

[5] JACOBSEN and SADRIEH (1996) report that subjects in their video-taped group discussion experiments on the one-shot trust game argue for "educating others" in the context of the "social supergame".

moved from the game. We can interpret the rejection rate in this treatment as a basic rate of resistance to unfairness. The difference in rejection rates is then the part added by the contributions to group reputation.

3. Model and Procedure

To simplify data analysis, we use a reduced version of the ultimatum game, similar to what BOLTON and ZWICK (1995) introduced as the *cardinal ultimatum game*, or what GALE, BINMORE, and SAMUELSON (1995) refer to as the *ultimatum minigame*. In our game, the proposer is restricted to two alternatives: the equal split (5,5) or a division favouring himself (8,2). The responder cannot reject the equal split. She can, however, choose to reject the unequal offer, in which case both players receive nothing.

Compared to the standard ultimatum game, the reduced version used here allows simpler data analysis. All relevant data appears in one number for each role: subjects' behaviour is expressed in proposer equal offer rates and responder rejection rates only. Previous experimental studies (BOLTON and ZWICK 1995, ABBINK, BOLTON, SADRIEH, and TANG 1996) have shown that the reduced form ultimatum game captures the most relevant ultimatum game characteristics.

The game tree of the game we used in the experiments is depicted in figure 1. It is the same for the open and the covered response treatment. The difference between the treatments is that in the covered response condition the responder's choice was not reported to the proposer. Only after the complete session, proposers in the covered response treatment were informed about their earnings. From this information, they could derive how many times they were punished, but not when and by whom. During the sessions no attribution whatsoever could be made.

The experiments were computerised, with software developed using *RatImage* (ABBINK and SADRIEH 1995). The game was presented to the subjects in the game tree form, where the decisions were submitted by buttons at the branches of the tree. After a decision, the chosen branch was highlighted, the other ones lowlighted. In the open response treatment, the responder's choice and the resulting payoffs were immediately marked on the proposer's screen. In the covered response treatment, the proposer's screen only displayed a question mark between the two possible outcomes of that branch.

Each subject played in the same role, proposer or responder, during the entire session. The experiments were run using a revolving (or round-robin) matching scheme, such that each proposer met each responder only once. This was particularly important for the control condition with open responses. To ensure compatibility we used the same matching scheme in the covered response treatment, too. Eight rounds were played with eight proposers and eight responders.

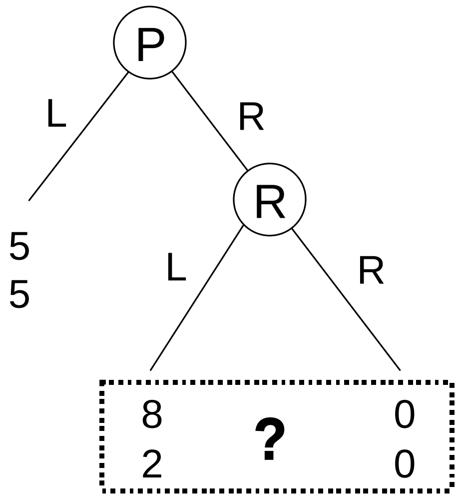

Figure 1

Due to the revolving matching scheme, punishment cannot be applied to one's own benefit. A responder will never meet the same proposer again, thus she cannot punish a proposer in the hope of getting a better offer from him in later rounds. Only as a group can the responders hope to benefit from educative punishment. Thus, using the revolving matching scheme ensures that the motivation of group reputation cannot interfere with supergame effects.

Six sessions of each treatment were conducted, with a total of 192 subjects. The experiments were run in the *RatioLab* at the Hebrew University of Jerusalem, Israel, and in the *Laboratorium für experimentelle Wirtschaftsforschung* at the University of Bonn, Germany. In a two-country experiment, the fact that the subjects in different countries are drawn from distinct subject pools must be taken into account. Differences in behaviour might arise from country-specific cultural environments, but also from a different composition of the subject pools with respect to educational background, gender, age, majors of study, and others. In fact, in the four country study by ROTH, PRASNIKAR, OKUNO-FUJIWARA, and ZAMIR (1991), the Israeli subjects' behaviour was slightly different from behaviour in the other countries. In Jerusalem, lower offers and a higher tendency to accept low offers were observed in the ultimatum game. In the competitive ultimatum game experiment by ABBINK, DARZIV, GILULA, GOREN, IRLENBUSCH, KEREN, ROCKENBACH, SADRIEH, SELTEN, and ZAMIR (1999) students from the Hebrew University of Jerusalem tended to make significantly higher offers than subjects at the University of Bonn. Thus, the possibility of subject pool differences must be taken into account. We controlled for this possibility by splitting the two treatments between the two locations evenly. Three sessions of each treatment were run in each laboratory. Hence, if subject pool differences should exist, they cannot be in conflict with treatment differences.

All subjects were volunteers and were only given monetary incentives. The sessions started with an introductory talk of about 10 minutes. The written instructions that were handed out to the subjects are reproduced in the appendix. The sessions were conducted in the local language of each country. Much care was taken to ensure that the instructions were equivalent in both countries. The instructions were first written in English and then translated into each local language by a member of the local laboratory team. In the next step, another team member translated the translation back into English, without seeing the original English text. This procedure was repeated until the back-translation and the original text had converged. Convergence, however, was reached rather quickly, since a very neutral and technical phrasing was used. The same method was applied to the screen output, which was also displayed in the local language of each country.

The social composition of the two subject pools was similar, since both laboratories are located in social science buildings and both subject pools mainly consisted of students of social sciences. The exchange rates of points to cash were adjusted in the two countries in a way that total earnings were comparable, in terms of teaching assistants' average hourly wage rates at each location. The exchange rate of DM 0.50 (roughly US-$ 0.33 at that time) per point was used in Bonn, and NIS 0.75 (about US-$ 0.25 at that time) was used in Jerusalem. Since the experiments were short (about 30-45 minutes in total), the resulting payoffs were on average well above the typical student's per hour wage.

4. Results

First, we focus on the responder behaviour. We begin with the analysis of aggregate rejection rates over the sessions. The raw data of the experiment are available upon request.

4.1. Responder Rejection Rates

Table 1 shows the average overall rejection rates (rejected unequal offers to total unequal offers) in the six sessions of each treatment, ordered from the lowest to the highest. The Jerusalem sessions are marked with a cross, the Bonn sessions with an asterisk.

Table 1. Average rates of rejected unequal offers in each session (in percent)

Covered	6.5^{+}	17.6*	22.7^{+}	26.1*	31.0*	31.3^{+}	∅=22.5
Open	10.0^{+}	20.0*	40.0*	43.5*	50.0^{+}	80.0^{+}	∅=40.6

The rejection rates show that, even when the response is not reported to the proposer, almost one quarter of all unequal offers are turned down. This is clear evidence for responders' resistance to unfairness that is entirely independent of all considerations of monetary payoff maximisation. Responders cannot openly punish proposers in the covered response treatment - not even as a group - in order to receive higher payoffs later. Thus, the relatively high average rejection rate (22.5%) is evidently motivated by negative emotions towards unfair actions or distributions. Responders are willing to pay a price solely to soothe their anger concerning the proposer's greed. The disutility of unfair outcomes that in some way or another is contained in all fairness utility models can be interpreted as a formalisation of such an emotional component.

Observation 1. *In the covered response treatment, substantially positive rejection rates are observed.*

However, fairness utility models do not explain a different aspect of our data. There is a significant difference in the rejection rates of the two treatments. The average rejection rates of the open response condition are about 75% higher than those of the covered treatment. The difference is significant with a *p*-value of 0.051, according to the Mann-Whitney U-test applied to the average rates of rejection in sessions. The extent to which more rejections are observed in the open response treatment must be attributed to the visibility of the rejection. The difference caused by visibility could be based on the fact that visibility turns rejection into an act of reciprocal punishment. Since visibility allows that the reciprocation can uniquely be ascribed to the reciprocating subject, the connection between punisher, the reason for punishment, and the addressee of the punishment becomes unambiguous. This - in a second step of reasoning - allows for an immediate perception of the educational goal of punishment by the proposers.

Observation 2. *In the open treatment, unequal offers are rejected significantly more often than in the covered treatment.*

In this sense, the visibility of punishment enables responders to educate proposers with each rejection of an unfair offer and, thus, to build up a group reputation of being "tough". Obviously, proposers facing a group of "tough" responders will tend to switch to more equal split offers. A similar type of behaviour is reported by WINTER and ZAMIR (1996). The notion of group reputation is well in line with the hypothesis of population rationality put forward in that work.

4.2 Does Behaviour Change Over Time?

Figure 2 shows the aggregate rejection rates over the eight rounds of the experiment. It is consistent with the group reputation hypothesis that the differences between the rejection rates across treatments diminish towards the end of the session: in the last two rounds, when contributing to group reputation makes little or no sense, almost no difference between the treatments can be observed.

The fact that average rejection rates get closer to one another is mainly due to the tendency of the rejection rates in the open response treatment to fall over time. From the first to the second half of a session (four rounds each), the aggregate rejection rate falls from 39.8% to 29.1% in the open response treatment. The decrease is significant at $p = 0.015$, according to the Wilcoxon matched pairs signed rank test, applied to the difference of rejection rates between the first and the second half of the experiment in the six independent sessions. In contrast, the rejection rates in the covered response treatment fall only slightly (from 24.2% to

21.4%), and the decrease is not significant. The corresponding numbers for the single sessions are shown in the following table 2.

Observation 3. *In the open treatment, responder rejection rates fall significantly from the first to the second half of the experiment. In the covered treatment, no trend can be detected.*

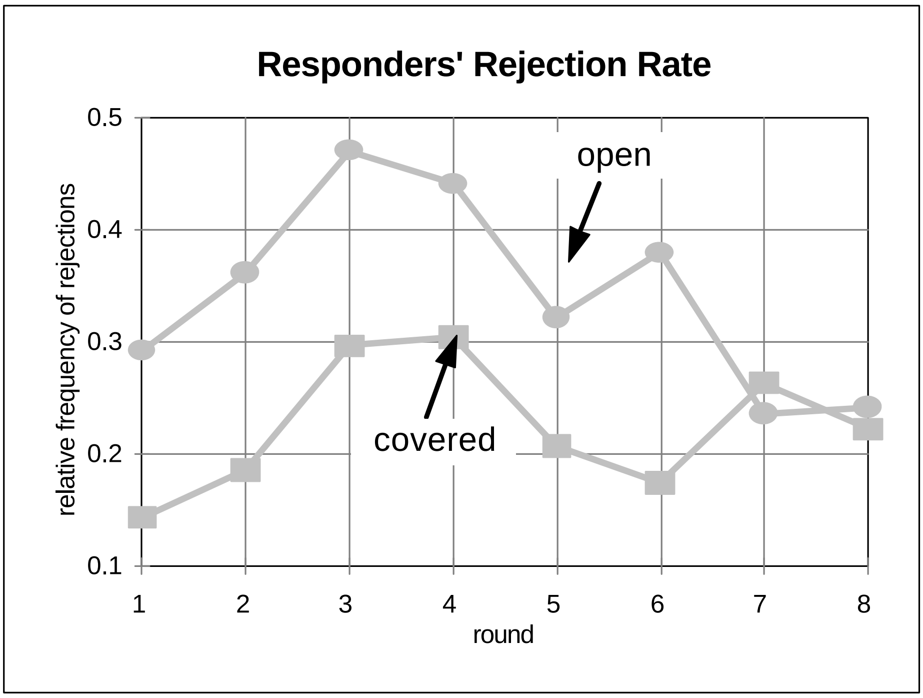

Figure 2

Table 2. Rejection rates in the first and the second half of the experiment

Session	Open treatment Rounds 1-4	Open treatment Rounds 5-8	Open treatment Δ	Covered treatment Rounds 1-4	Covered treatment Rounds 5-8	Covered treatment Δ
1*	0.44	0.43	!0.01	0.38	0.23	!0.15
2*	0.18	0.21	+0.03	0.33	0.29	!0.04
3*	0.44	0.40	!0.04	0.19	0.17	!0.02
4^{+}	0.52	0.43	!0.09	0.20	0.25	+0.05
5^{+}	0.82	0.75	!0.07	0.29	0.33	+0.04
6^{+}	0.18	0.07	!0.11	0.13	0.00	!0.13
Average	0.43	0.38	!0.05	0.25	0.21	!0.04
Aggregate	0.40	0.29	!0.11	0.25	0.21	!0.04

*= Bonn session $^{+}$= Jerusalem session

This result, together with the result that average rejection rates over the complete sessions in the covered response treatment are significantly lower than those in the open response treatment, leads to the following conclusion: The fairly stable rate of rejections in all rounds of the covered response treatment reflects a basic rate of rejections due to resistance to unfairness in our subject pool. The higher rates of rejection in the early rounds of the open response treatment appear to incorporate some amount of rejections motivated by group reputation in addition to the basic rate of rejections due to resistance to unfairness. Towards the end of the sessions, under the open response condition, the added rate of rejections motivated by group reputation decreases, leading to the observed decrease in the difference between the total rejection rates of the two treatments.

4.3. Proposer Equal Offer Rates

In figure 3, the round by round aggregate equal offer rates are depicted. Table 3 shows the session averages equal offers rates, ordered from the smallest to the largest. Again, Jerusalem sessions are marked with a cross, and Bonn sessions with an asterisk.

Table 3. Average rates of equal offers in each session (in percent)

Covered	31.3+	46.9*	50.0+	51.6+	54.7*	64.1*	∅=49.8
Open	21.9*	21.9*	21.9+	28.1*	43.8+	76.6+	∅=35.7

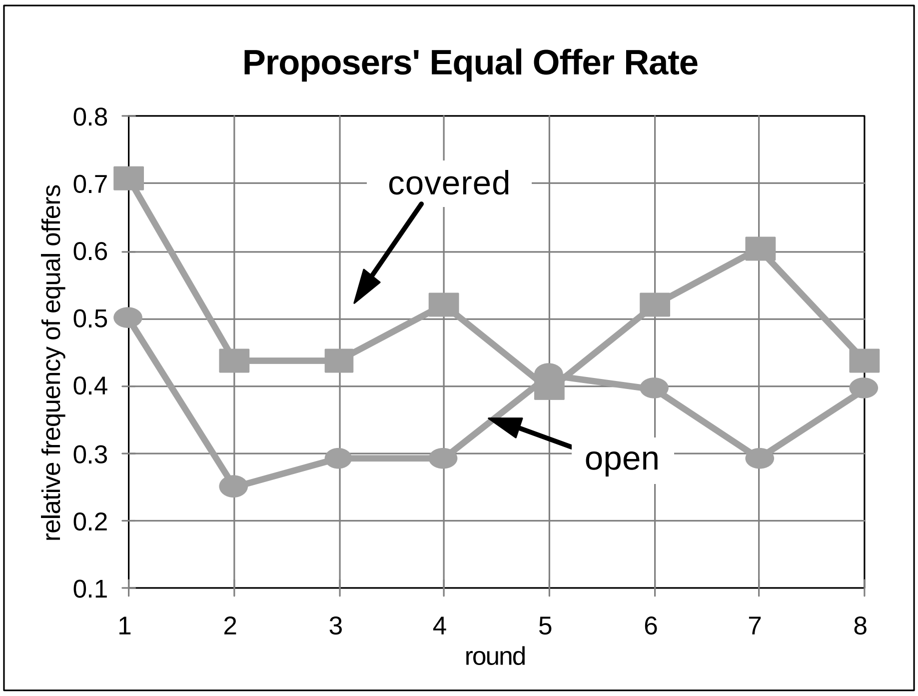

Figure 3

In the covered response treatment, we observe equal offers in half of the cases. This rate is about 40% higher than in the open response treatment. Aggregated over all eight rounds, the difference across treatments is significant at $p = 0.026$ (one-tailed), according to the Mann-Whitney U-test, applied to average equal offer rates in the sessions.

Already in the very first round, we observe a higher equal offer rate in the covered response treatment. 70.8% of the proposers choose an equal offer in the first round, whereas 50.0% do so in the open response treatment. According to Fisher's exact test, this difference is significant at $p = 0.019$ (one-tailed). Note that the individuals' equal offers are independent in the very first round of the experiment.

Observation 4. *The equal offer rates are significantly higher in the covered response treatment than in the open response treatment.*

It is interesting that the equal offer rates in the covered response treatment are significantly higher than in the open treatment, although the rejection rates of unequal offers are lower. It seems plausible that the high equal offer rates in the covered response treatment are due to an enhanced risk avoidance of the proposers. If a proposer makes an unequal offer, his payoff can vary between 0 and 8, depending on the responder's choice. In contrast, he is guaranteed a payoff of 5 when making an equal offer. Thus, if the proposer believes that there is a positive probability for some responders to reject the unequal offer, the payoff on the right branch is uncertain, with an unknown probability, whereas the payoff on the left branch is certain.

To explain the discrepancy in proposers' first round behaviour across treatments, the following behavioural hypothesis seems suitable: Subjects proposing in the open response treatment tend to test responders' propensity to reject by selecting the unequal offer branch. Learning from success and failure, however, is completely impossible for proposers in the covered response treatment. It seems that the lack of feedback increases the tendency to avoid risk and leads to the significantly higher equal offer rates in the entire session in the covered response treatment.

4.4. Is Group Reputation Effective?

Given that responders in the open response treatment use punishment to building up a group reputation for being "tough", the question arises whether their attempt is successful. Do early rejections actually induce proposers to shy away from the unequal offer, because of the expectation of punishment? If the answer is "yes", then we should observe an increase of equal offer rates in those proposer populations that faced the highest rejection rates. For each session, we examine the rejection rates in the first half of the experiment and the change of equal offer rates from the first to the second half. We compute the correlation of these two measures over the sessions. If group reputation building is effective, then a tendency for high first half rejection rates to be followed by high increases in equal offer rates should be observed.

Figure 4 shows that, in fact, there is a strong correlation in the predicted direction. The greater the responders' reluctance to accept unfair offers, the greater is the rise in the frequency of equal offers with time. The Spearman rank correlation coefficient of $r_s = 0.93$ is significantly different from zero at $\alpha = 0.05$ (one-tailed). Thus, high frequencies of rejections correlate to higher increases in equal offer rates.

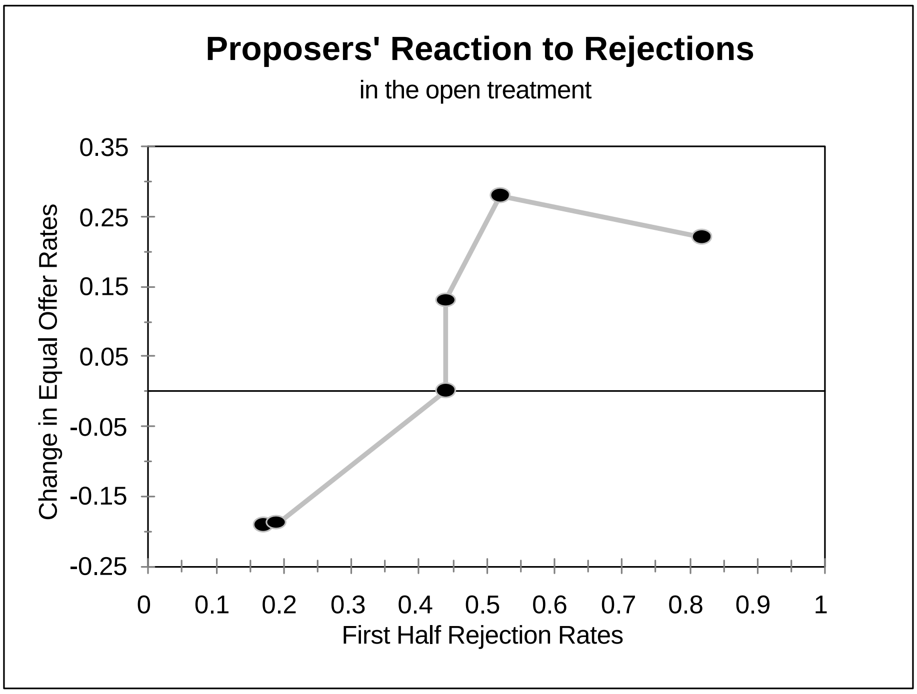

Figure 4

We now examine whether the positive correlation between rejection rates and the change in equal offer rates can be detected on individual level. To see this, we check each round in which a proposer switches from a preceding round's unequal to a current round's equal offer. We count how often the equal offer was made after the last round's unequal offer was rejected, and compare this to the frequency of equal offers following an accepted unequal offer. If proposers were successfully educated with rejections, then we should observe systematically more switches after punishments than after accepted unequal offers.

Figure 5 shows that the group reputation building is actually effective on the individual level. Observing a rejection, i.e. being punished, influences the proposers' behaviour. Proposers' propensities to choose the equal offer is rather low if their unequal offer in the last round was accepted (relative frequency 11.4%). But, if punished, their tendencies to switch is almost four times higher (relative frequency 44.3%). This is consistent with the hypothesis that proposers in the open response treatment attempt to test the probability of rejection and switch to the equal offer if that probability is perceived as high.

The observed pattern of switches points in the same direction in all six sessions of the open response treatment. Table 4 shows the frequencies of switches after punishments and after accepted unequal offers. The last column shows the difference between the relative frequencies of switches. In all six sessions this measure has a positive value. Thus, a switch occurs relatively more often after rejected than after accepted unequal offers. The matched-pair sign test rejects the null hypothesis that a switch is equally likely after punishment as after an accepted unequal offers with at $p = 0.016$ (one-tailed).

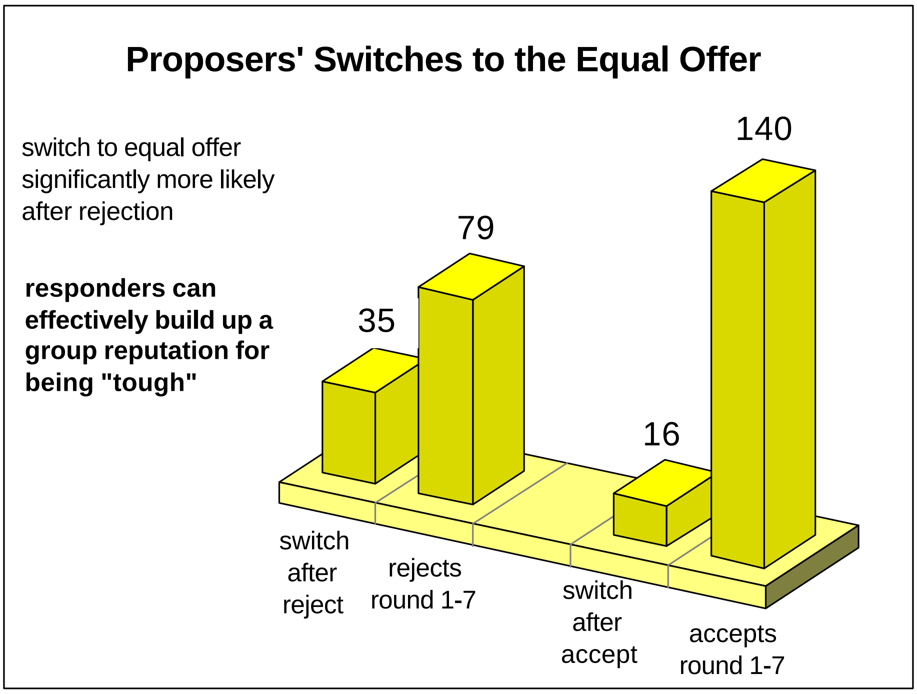

Figure 5

Observation 5. *In the open treatment, proposers tend to switch to the equal offer significantly more often after having observed a rejection than after accepted unequal offers.*

After having switched to an equal offer, proposers often switch back. Of all equal offers, 46% are followed by an unequal offer. Thus, although proposers do react to punishment, they also show a strong tendency to switch back to the unequal offer. This implies that high rejection rates are necessary for a sustained group reputation effect on the responders side. Interestingly, the frequency of switching from the equal to the unequal offer is almost the same in both treatments: under the covered condition we observe a relative frequency of 47%.

Table 4. Frequency of switches from the unequal of the equal offer

Session	Switch after Rejection (1)	Rejections Rounds 1-7 (2)	Switch after Accepted offer (3)	Accepted offers rounds 1-7 (4)	Difference in rel. frequency (1)/(2)-(3)/(4)
1	7	17	3	24	+0.29
2	2	10	2	33	+0.14
3	5	18	3	26	+0.16
4	8	17	4	17	+0.24
5	11	12	1	3	+0.58
6	2	5	3	37	+0.32
Σ	35	79	16	140	+0.33

The results show that proposers in fact tend to react to punishment in a manner that is favourable to the responders. If responders anticipate such behaviour, it can be reasonable for them to contribute to the group reputation by rejecting unequal offers. Of course, when applying punishment as a means of group reputation building, responders are in a social dilemma situation. Due to the revolving matching scheme of the experiment, no responder can profit immediately from her own rejection. She can only benefit from other responders' contributions to the group reputation, and others will benefit from her contribution. The revolving matching scheme eliminates supergame effects that are inherent to repeated play on individual level. On group level, however, the revolving matching scheme creates a public good situation, in which each rejection of an unfair offer contributes further to the reputation of the group members for being "tough".

4.5. Are Contributions to Group Reputation Profitable?

We have found evidence that contributions to the group reputation are effective in the sense that proposers are influenced towards making more equal offers, after having observed rejections. However, since rejections are costly for the responders, the effectiveness of such educative punishment does not immediately imply that such behaviour is profitable for responder populations. In this section, we analyse how rejection rates and responder profits are distributed over the populations.

Figure 6 shows the relationship between the rejection rates in a session and the average responder payoff (in per cent of the cake) in that session. The numbers are computed on the basis of all eight rounds of the session. If contributing to the group reputation is profitable, then we should observe higher responder payoffs in the sessions with high rejection rates. The correlation between responder payoff and rejection rates seems to be U-shaped rather than monotonously rising or falling. It seems that the more extreme patterns of behaviour are more profitable than those in between. Contributing to the group reputation seems to be profitable only if the rejection rates are sufficiently high to induce a strong effect. Where the rejection rates are intermediate, the responders pay the price for punishment, but the frequency of unequal offers is not sufficiently decreased to compensate the costs of punishment. To illustrate this point, we have included the vertical line into the figure. At a rejection rate of 0.375, expected payoff maximising proposers are exactly indifferent between the equal and the unequal offer. Thus, rejection rates close to that line are least profitable. The very low and especially the very high rejection rates are preferable for payoff maximising responder populations. However, it should be noticed that the data basis is too small to provide clear statistical evidence for this effect.

4.6. Do Contributions to Group Reputation Increase Efficiency?

Efficiency in our context can simply be understood as the total payoff gained by responders and proposers in a session together. Obviously every rejection reduces the total payoff in a round. The efficiency loss, in points, is exactly the absolute overall number of rejections in a session, multiplied by the cake size of 10. On the other hand, if the proposers are successfully educated by high early rejection rates to increase the number of equal offers, the total number of rejections of a session may be small, since the absolute number of unequal offers is reduced. Hence, if the effect of early punishment is strong enough, then high rejection rates in the beginning of a session need not necessarily lead to less efficiency than in a session with a constant moderate rate of unequal offers and rejections.

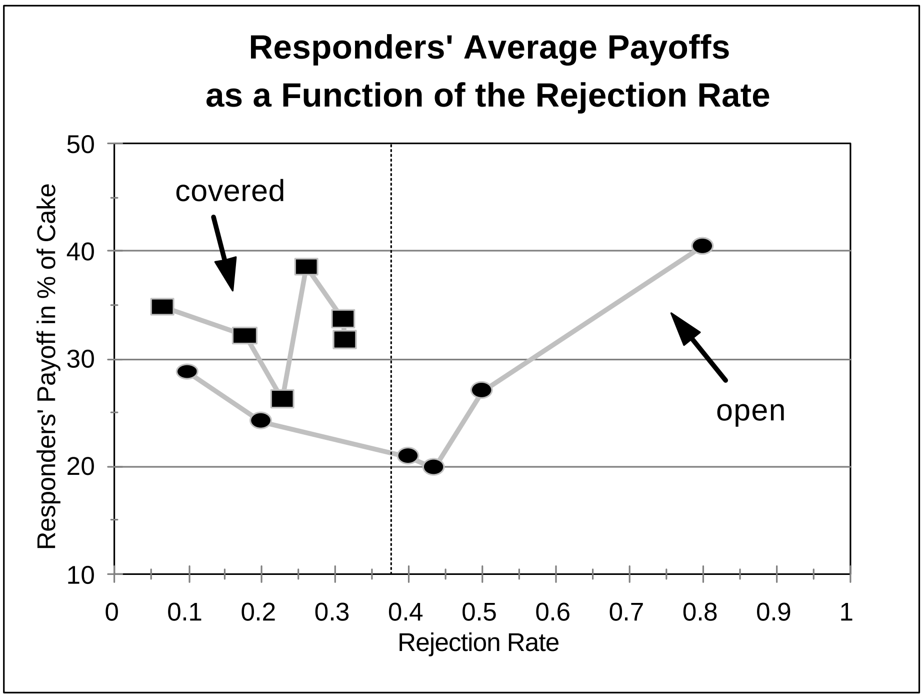

Figure 6

In figure 7, average proposer payoffs are depicted on the x-axis and the average responder payoffs on the y-axis. The dots mark the average responder and proposer payoffs in the sessions, where the size of the dots correspond to the average rejection rate in that session. The diagonal lines are iso-efficiency lines. Different points on the same iso-efficiency line represent allocations with the same efficiency, but a different distribution between proposers and responders. It can be seen that not only the average responder payoff, but also efficiency is lowest with intermediate rejection rates. The highest efficiency is achieved in the session with the lowest rejection rate, where, evidently, most of the efficiency gain is extracted by the proposers. Thus, high rejection rates have a similar effect on efficiency as on responder payoffs. If rejection rates are intermediate, then the contributions to group reputation are too small to outweigh the efficiency losses caused by the rejections. However, we must once again point out that the data basis is small and no conclusive inference can be drawn.

Observation 6. *The highest responder payoffs and the highest efficiency are observed in the sessions in which rejection rates are either very low or very high.*

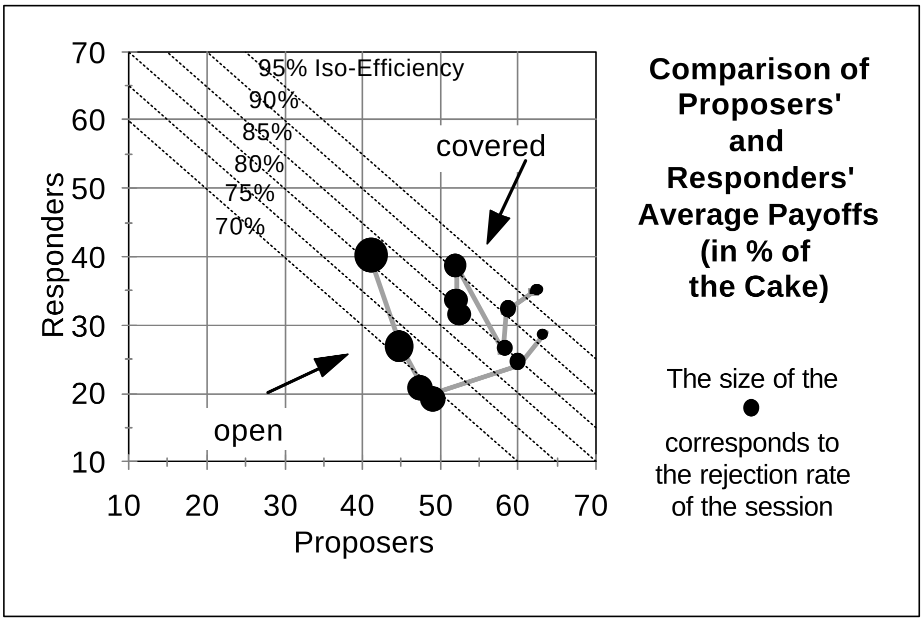

Figure 7

Finally, in figure 7, it can immediately be noticed that efficiency in the covered treatment is greater than in the open treatment. This is due to the lower rejection rates coinciding with higher equal offer rates. The difference is significant at $p = 0.017$ (one-tailed) according to the Mann-Whitney U-test applied to the average per round total payoff in the single independent sessions.

5. Summary and Conclusions

We conducted an experiment using a simple ultimatum game. Our two-treatment design enabled us to separate a base rate of rejections motivated by responders' *resistance to unfairness* from an additional rate of rejections that seems to have been motivated by *group reputation* building.

In our open response treatment, the responder's choice was reported to the proposer, while it was not reported in the covered response treatment. Rejection rates in the covered response treatment - with an average of 23.3% - were considerable. Since rejections in the covered response treatment can neither have been motivated by individual nor group reputation building, we conclude that the high rejection rates in these sessions are due to the responders' inherent *resistance to unfairness*. This result is completely in line with the central assumption of fairness utility models, such as those suggested by BOLTON (1991), RABIN (1993), BOLTON and OCKENFELS (1999), and FEHR and SCHMIDT (1999).

The significant difference in rejection behaviour across treatments, however, is not compatible with any of the mentioned fairness utility models. We observed a significantly higher rate of rejections in the open response treatment than in the covered response treatment. This observation led to the conclusion that rejections in the open response treatment are not only motivated by responders' resistance to unfairness, but are also contributions to the group's reputation for being "tough". In the context of our experiment, in which each responder met each proposer only once, building up an individually profitable reputation was impossible. But, by building up a group reputation for rejecting unfair offers, the group of responders attempted and managed to influence the behaviour of the group of proposers in direction of more equal offers.

The dynamics of rejection behaviour provided more evidence for our conclusion. The average per round rejection rates in the open response treatment decreased in the last rounds of each experimental session, as contributing to the group reputation had less and less potential impact. In the very last rounds, these rates actually approached the average rejection rate of the covered response treatment, which stayed around 23% and exhibited no time trend. This evidence suggests that there is a basic rate of rejections in ultimatum game behaviour that is due to the responders' resistance to unfairness. This basic rate corresponds to the rate of rejections in the covered response treatment and in the last rounds of the open response treatment. The excess of the rejection rates over the basic rate in the early rounds of the open response treatment can be attributed to contributions of the responders to the reputation of their group for being "tough".

After finding that responders are willing to contribute to their group's reputation, it seems natural to ask whether building up such a group reputation is effective and profitable for the responders. The answer our data gives is partially as expected and partially quite surprising. On the one hand, we find that almost all proposers react as expected: when facing a group of "tough" responders, proposers make equal offers significantly more often than when facing "compliant" responders. On the other hand, it seems surprising that, although proposers react to punishment as expected, only extreme rejection behaviour leads to higher profits for the reponders. In other words, responders fare best, either if they are very "compliant" or if they are very strict in rejecting unequal offers. The responder groups that only occasionally reject unfair offers, end up paying more for these rejections than they gain from the positive reaction of the proposers. Thus, rejecting unequal offers is always effective, but is not always profitable or efficient. Building up a "tough" group reputation only pays, if enough unequal offers are rejected early on.

Finally, we observe that significantly more equal offers are made by proposers in the open than in the covered treatment. Our conjecture is that proposers in early rounds of the open treatment "test" responders' reactions to unequal offers. In the covered treatment, such testing is not possible. This seems to explain the significantly higher number of unequal first round offers in the open compared to the covered response treatment.

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Appendix A. The Written Instructions

Player Types:

There are two types in the experiment: player 1 and player 2.
After the introduction, each participant draws one of 16 cards.
The drawn card defines the terminal number of the participant.
The terminal number determines the participant's type for the whole experiment.

Structure:

The experiment consists of eight rounds.
In each round 8 pairs of participants are formed:
each pair with one player 1 and one player 2.
In every round, every player 1 meets a different player 2, and vice versa.
Thus, no participant meets the same participant a second time.
The participants are not allowed to speak with each other during the experiment.

Decisions:

Each round begins with player 1 choosing one of two alternatives: Left or Right.
Player 2 is informed about the choice of player 1.
If player 1 chooses Left, the round ends.
If player 1 chooses Right, player 2 chooses one of two alternatives: Left or Right;
player 1 is not informed about the choice of player 2;
then the round ends.

Profits in Points:

Player 1	Player 2	Player 1 receives	Player 2 receives
chooses Left	has no choice	5	5
chooses Right	chooses Left	8	2
chooses Right	chooses Right	0	0

The Question Mark:

If player 1 chooses Right, he will only see a question mark on the screen: since he will not be informed about the choice of player 2, he will neither know his own profit, nor the profit of player 2.

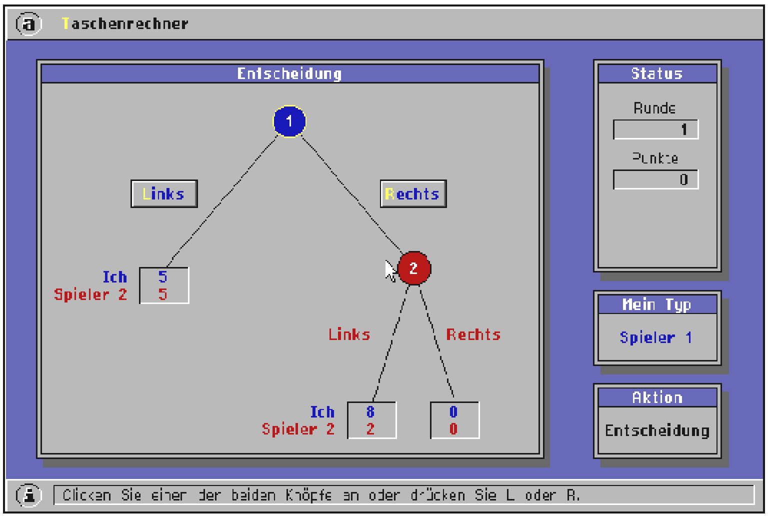
After the last round of the experiment all participants will be informed of their total profits, but the players 1 will not be informed of the value of each received ? separately.

Exchange Rate:

Each point earned in the experiment is equivalent to 50 pfennigs / 75 Agorot.

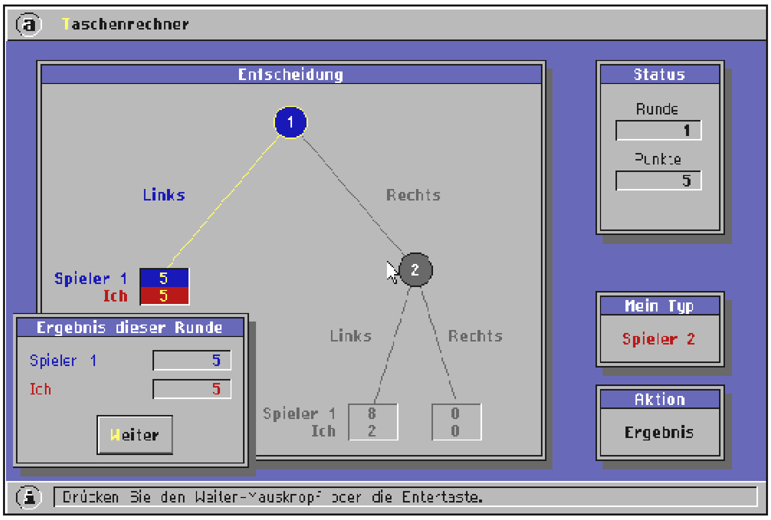
The Decision Screen for Player 1

Player 1 chooses one of his alternatives by clicking the corresponding mousebutton on the screen, or by pressing the corresponding key on the keyboard ("L" for "Left", "R" for "Right", resp.).

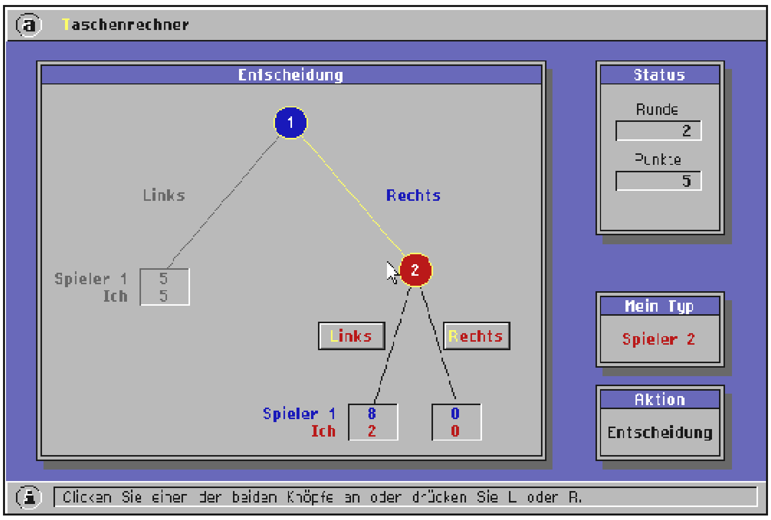


The Decision Screens for Player 2

If player 1 has chosen "Left", then player 2 is informed about player 1's choice, but has no own decision to make.



If player 1 has chosen "Right", then player 2 chooses one of his alternatives by clicking the corresponding mousebutton on the screen, or by pressing the corresponding key on the keyboard ("L" for "Left", "R" for "Right", resp.).



Appendix B: The Data

Session 1: Covered, Bonn

1	2L 16	11R 15R	13R 3L	8L 1	14R 9L	17L 6	12R 5L	18L 7
2	2R 15L	11L 3	13R 1R	8R 9R	14R 6L	17L 5	12R 7L	18L 16
3	2L 3	11R 1R	13R 9R	8L 6	14L 5	17R 7L	12R 16L	18L 15
4	2L 1	11L 9	13R 6L	8L 5	14R 7L	17L 16	12R 15R	18L 3
5	2L 9	11R 6L	13R 5L	8R 7L	14L 16	17L 15	12L 3	18L 1
6	2R 6L	11L 5	13R 7L	8R 16L	14R 15R	17R 3L	12L 1	18L 9
7	2L 5	11L 7	13L 16	8L 15	14L 3	17L 1	12L 9	18L 6
8	2R 7L	11R 16L	13L 15	8R 3L	14R 1R	17R 9R	12L 6	18L 5

Session 2: Covered, Bonn

1	2L 16	11L 15	13L 3	8L 1	14L 9	17L 6	12L 5	18L 7
2	2L 15	11L 3	13R 1L	8L 9	14L 6	17L 5	12L 7	18L 16
3	2L 3	11R 1R	13R 9L	8R 6L	14L 5	17R 7L	12R 16L	18R 15L
4	2R 1R	11L 9	13L 6	8R 5R	14L 7	17L 16	12L 15	18L 3
5	2L 9	11R 6L	13R 5R	8R 7R	14R 16L	17L 15	12R 3R	18L 1
6	2L 6	11L 5	13L 7	8L 16	14R 15L	17L 3	12L 1	18R 9L
7	2L 5	11L 7	13R 16L	8R 15L	14R 3R	17R 1L	12L 9	18L 6
8	2L 7	11R 16L	13R 15L	8L 3	14R 1L	17L 9	12L 6	18L 5

Session 3: Covered, Bonn

1	2R 16L	11L 15	13L 3	8L 1	14R 9L	17L 6	12L 5	18L 7
2	2R 15L	11R 3L	13R 1L	8L 9	14R 6L	17L 5	12L 7	18R 16L
3	2R 3L	11R 1L	13L 9	8R 6R	14R 5R	17L 7	12R 16R	18R 15L
4	2R 1L	11R 9L	13L 6	8L 5	14R 7L	17L 16	12L 15	18L 3
5	2R 9L	11R 6L	13R 5L	8R 7L	14R 16L	17L 15	12L 3	18R 1L
6	2L 6	11R 5R	13R 7L	8L 16	14L 15	17L 3	12L 1	18L 9
7	2R 5R	11R 7L	13L 16	8L 15	14L 3	17R 1L	12L 9	18L 6
8	2R 7L	11R 16L	13R 15L	8R 3L	14R 1L	17L 9	12R 6R	18R 5L

Session 4: Covered, Jerusalem

1	15R 4L	11L 2	13L 3	9R 1L	14R 8L	16L 6	12R 5L	10L 7
2	15L 2	11R 3L	13L 1	9R 8R	14R 6L	16R 5L	12L 7	10R 4L
3	15R 3L	11L 1	13R 8L	9R 6L	14R 5R	16R 7L	12L 4	10L 2
4	15L 1	11R 8L	13R 6L	9R 5R	14R 7R	16R 4L	12R 2L	10L 3
5	15R 8R	11L 6	13R 5L	9R 7L	14R 4L	16L 2	12R 3L	10R 1R
6	15R 6L	11R 5L	13R 7L	9R 4L	14R 2L	16R 3L	12R 1R	10L 8
7	15L 5	11L 7	13R 4L	9R 2L	14R 3L	16R 1R	12R 8R	10L 6
8	15L 7	11R 4L	13R 2L	9R 3L	14R 1R	16R 8L	12R 6L	10L 5

Session 5: Covered, Jerusalem

1	15L 4	11L 2	13R 3L	9R 1L	14L 8	16L 6	12L 5	10L 7
2	15R 2R	11R 3R	13R 1L	9R 8L	14R 6L	16L 5	12R 7L	10L 4
3	15L 3	11L 1	13R 8R	9L 6	14R 5L	16R 7L	12L 4	10L 2
4	15R 1L	11R 8L	13R 6L	9R 5L	14R 7R	16L 4	12R 2R	10L 3
5	15R 8L	11R 6L	13R 5L	9R 7L	14L 4	16R 2R	12L 3	10L 1
6	15L 6	11L 5	13R 7R	9L 4	14R 2L	16L 3	12R 1L	10L 8
7	15R 5L	11R 7L	13R 4R	9L 2	14R 3L	16L 1	12L 8	10L 6
8	15R 7R	11R 4R	13R 2L	9L 3	14L 1	16L 8	12L 6	10L 5

Session 6: Covered, Jerusalem

1	15L 4	11L 2	13R 3L	9L 1	14L 8	16R 6R	12R 5L	10L 7
2	15R 2L	11R 3L	13R 1L	9L 8	14R 6L	16L 5	12R 7L	10L 4
3	15L 3	11L 1	13R 8L	9L 6	14R 5L	16R 7R	12R 4L	10L 2
4	15R 1L	11R 8L	13R 6L	9L 5	14L 7	16L 4	12R 2L	10L 3
5	15L 8	11R 6L	13R 5L	9L 7	14L 4	16R 2L	12R 3L	10L 1
6	15R 6L	11L 5	13R 7L	9L 4	14L 2	16R 3L	12R 1L	10L 8
7	15L 5	11L 7	13R 4L	9L 2	14R 3L	16R 1L	12R 8L	10L 6
8	15L 7	11L 4	13R 2L	9L 3	14R 1L	16L 8	12R 6L	10L 5

Session 7: Open, Bonn

1	2L 16	11R 15L	13L 3	8L 1	14R 9L	17R 6L	12R 5R	18R 7L
2	2R 15R	11R 3R	13R 1R	8R 9L	14R 6L	17R 5R	12R 7L	18L 16
3	2L 3	11R 1L	13L 9	8R 6L	14R 5R	17R 7L	12R 16R	18R 15R
4	2R 1L	11R 9L	13R 6L	8R 5R	14R 7L	17R 16R	12R 15R	18L 3
5	2L 9	11R 6L	13R 5R	8R 7L	14R 16R	17L 15	12R 3R	18R 1L
6	2R 6L	11R 5L	13L 7	8R 16R	14R 15L	17R 3R	12L 1	18R 9L
7	2L 5	11R 7L	13L 16	8R 15L	14R 3R	17L 1	12L 9	18R 6L
8	2R 7L	11R 16R	13L 15	8R 3R	14R 1L	17L 9	12L 6	18R 5R

Session 8: Open, Bonn

1	2R 16L	11R 15L	13R 3L	8L 1	14L 9	17L 6	12R 5L	18L 7
2	2R 15L	11R 3R	13R 1L	8L 9	14R 6L	17R 5L	12R 7L	18L 16
3	2R 3L	11R 1L	13R 9L	8R 6L	14R 5R	17L 7	12R 16R	18L 15
4	2R 1L	11R 9L	13R 6L	8R 5L	14L 7	17R 16L	12R 15R	18L 3
5	2R 9L	11R 6R	13R 5R	8R 7L	14R 16L	17L 15	12R 3L	18L 1
6	2R 6R	11R 5L	13R 7L	8R 16R	14R 15L	17R 3R	12R 1L	18R 9L
7	2R 5L	11R 7L	13R 16R	8R 15L	14R 3L	17L 1	12R 9L	18R 6L
8	2R 7L	11R 16L	13R 15L	8R 3L	14R 1L	17L 9	12R 6L	18R 5L

Session 9: Open, Bonn

1	2R 16L	11R 15L	13L 3	8R 1L	14L 9	17R 6R	12R 5L	18R 7R
2	2R 15L	11L 3	13R 1L	8R 9L	14R 6R	17R 5L	12R 7R	18R 16L
3	2R 3R	11R 1L	13R 9L	8R 6R	14L 5	17R 7R	12R 16R	18L 15
4	2R 1L	11R 9R	13R 6R	8R 5L	14R 7R	17R 16L	12L 15	18L 3
5	2R 9L	11L 6	13R 5L	8R 7R	14L 16	17R 15L	12R 3L	18L 1
6	2R 6R	11R 5L	13R 7R	8R 16R	14L 15	17R 3R	12R 1L	18L 9
7	2R 5L	11R 7R	13R 16L	8R 15L	14R 3L	17R 1L	12R 9L	18R 6R
8	2R 7R	11L 16	13L 15	8R 3L	14R 1L	17R 9L	12R 6R	18R 5L

Session 10: Open, Jerusalem

1	15R 4L	11L 2	13L 3	9R 1L	14L 8	16R 6R	12R 5L	10L 7
2	15R 2R	11R 3L	13R 1L	9R 8R	14L 6	16R 5L	12L 7	10R 4R
3	15R 3L	11R 1R	13R 8L	9R 6L	14R 5R	16R 7L	12R 4R	10L 2
4	15R 1L	11R 8R	13R 6R	9L 5	14R 7R	16R 4R	12R 2R	10L 3
5	15R 8R	11L 6	13L 5	9L 7	14L 4	16L 2	12L 3	10R 1L
6	15R 6L	11L 5	13R 7L	9R 4L	14L 2	16R 3R	12L 1	10L 8
7	15R 5R	11L 7	13R 4R	9R 2R	14L 3	16L 1	12R 8L	10R 6L
8	15R 7L	11L 4	13L 2	9R 3L	14L 1	16L 8	12L 6	10R 5R

Session 11: Open, Jerusalem

1	15L 4	11L 2	13R 3R	9R 1R	14L 8	16L 6	12L 5	10L 7
2	15R 2L	11R 3R	13L 1	9L 8	14L 6	16R 5R	12R 7R	10L 4
3	15R 3R	11L 1	13L 8	9R 6R	14L 5	16L 7	12L 4	10L 2
4	15R 1R	11L 8	13R 6L	9L 5	14R 7R	16L 4	12L 2	10L 3
5	15L 8	11L 6	13R 5R	9R 7R	14L 4	16L 2	12L 3	10L 1
6	15L 6	11L 5	13L 7	9L 4	14L 2	16L 3	12L 1	10L 8
7	15R 5R	11L 7	13R 4L	9L 2	14L 3	16L 1	12L 8	10L 6
8	15L 7	11L 4	13L 2	9L 3	14L 1	16L 8	12L 6	10L 5

Session 12: Open, Jerusalem

1	15L 4	11L 2	13R 3L	9R 1R	14L 8	16R 6L	12L 5	10L 7
2	15R 2L	11R 3L	13R 1L	9L 8	14R 6L	16R 5L	12L 7	10R 4L
3	15R 3L	11R 1R	13R 8L	9L 6	14R 5L	16R 7R	12R 4L	10R 2L
4	15R 1L	11L 8	13R 6R	9R 5L	14L 7	16R 4L	12R 2L	10R 3L
5	15R 8L	11R 6L	13R 5L	9R 7L	14L 4	16R 2L	12R 3L	10R 1L
6	15L 6	11R 5L	13R 7L	9L 4	14L 2	16R 3L	12R 1R	10R 8L
7	15R 5L	11R 7L	13R 4L	9R 2L	14R 3L	16R 1L	12R 8L	10R 6L
8	15R 7L	11R 4L	13R 2L	9R 3L	14R 1R	16R 8L	12R 6L	10R 5L

Legend:

Each line represents one round of the session. Each column stands for one match. For example, "15 R 4 L" reads: terminal 15, proposer, chose Right, terminal 4, responder, chose Left.