What is fair, what is not?

An Experimental Approach to the Effects of Asymmetric Entitlements in an Ultimatum Game

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1. Introduction

Several conducted ultimatum game experiments have addressed the question of whether human behavior can be really solely explained by the pursuit of self-interest as predicted by economic theory. The vast majority of results show a completely different picture since subjects tend to offer as well as reject substantial amounts of money. Fairness norms are often relied upon to explain this kind of behavior.

Considering that the concept of fairness plays an important role in decision-making and social exchanges in general, it is crucial to understand how fairness norms are developed and how the perception of fairness may be influenced. There are several real life situations, such as negotiations between unions and employers or the allocation of resources, where a better understanding of this concept might lead to superior outcomes.

The aim of this laboratory experiment is to contribute to this area of research by investigating how the introduction of earned entitlements influences the perception of fairness. Based on an experiment by Carr et al. (2013), a new methodology is used to create asymmetric entitlements between proposers and responders in order to challenge the flexibility of fairness principles. By comparing the results to a control treatment, the experiment shall finally examine whether there is a change in fairness norms induced by the sense of entitlement and, if so, whether this change is divergent for proposers and responders.

2. Economic Theory and Empirical Evidence

2.1 The Ultimatum Game

From the perspective of classical game theory there are two subgame perfect Nash equilibria in the ultimatum game: The proposer either offers nothing or the smallest possible amount of money to the responder. In both cases the responder accepts the offer, since he is better off or at least indifferent (Riechmann, 2002: 140/141). Thus, both players act in a self-interested manner and thereby in accordance with the concept of homo economicus.

However, empirical evidence shows significant differences compared to theory. Güth et al. (1982) performed one of the first one shot ultimatum game experiments and were able to prove that results were rarely in line with the predicted Nash equilibria. Whereas proposers offer an average of 40 % of the pie, every second responder rejects offers of 20 % (Camerer, 2003: 43).

Social preferences or fair-mindedness of the players are often seen as possible reason for this behavior. Responders reject offers which are perceived as unfair in order to punish the proposer (negative reciprocity), although they are worse off compared to accepting it. On the other hand, positive proposer offers are usually explained by altruism, fairness norms or inequity aversion (Camerer, 2003: 49).

But there could also be another explanation for this kind of proposer behavior. Anticipating negative reciprocity of responders, proposers could offer higher shares of the pie with the only purpose of avoiding rejections. From this perspective, the higher offers would have a purely strategic character. Forsythe et al. (1994) examine this aspect more closely by comparing offered amounts of money between a dictator game and an ultimatum game. In the dictator experiment, where there is no possibility for negative reciprocity by the responders, the average offer is significantly lower than in the ultimatum treatment. This indicates that offering higher amounts of money cannot be

solely explained by the principle of fairness. Instead, it seems that a proposer's decision is guided by a combination of altruism as well as strategic thinking.

2.2 Entitlements

There are several extensions of the classical ultimatum game. One of these extensions is the introduction of entitlements. Payoff distributions are significantly influenced if players have a legitimate claim on a certain share of the pie. This indicates that the players' perception of fairness changes compared to the classical scenario (Camerer, 2003: 76).

Hoffmann et al. (1994) examine the impact of entitlements by having the players respond to general knowledge questions at the start of the experiment. Players with a good performance in the quiz are entitled to be proposers whereas players with a poor performance are selected to be responders. In contrast to the classical ultimatum game conducted in the baseline treatment, proposer offers are now significantly lower although rejection rates remain constant. Due to their good performance, it seems as if proposers feel entitled to a bigger share of the pie. Interestingly, responders seem to acknowledge this claim since rejection rates remain unchanged.

Regarding the introduction of entitlements, there have been many other experimental approaches in previous research. In a dictator game experiment of Cherry et al. (2002) the players are randomly selected as dictator and receiver but the pie size for each pair is determined by the performance of the dictator in a quiz. Thus, the dictators are given the chance to earn money. In the baseline treatment where the standard ultimatum game is played, only 19 % of the dictators make a "zero offer" and keep the whole pie for themselves. In the earnings treatment instead, this percentage of "zero offers" rises to 79 %. These results indicate that dictators are less willing to share the pie with the receiver if they have earned the money on their own. Keeping the whole amount for themselves is now, in contrast to the baseline treatment, considered fair by the majority of dictators.

Oxoby and Spraggon (2008) extend the experiment of Cherry et al. in such a way that also receivers are enabled to earn money. This shift in entitlement has a huge impact on the players' payoffs. In treatments where solely receivers are responsible for producing the pie, dictator offers increase significantly. In a few cases even the whole pie was offered to the receiver. Thus, the introduction of earnings-based entitlements can lead to patterns of behavior contrary to the theory of homo economicus.

Similar results are presented by Carr et al. (2013) for an ultimatum game experiment. Here again, responders produce the pie by solving math problems. While the average offer in the baseline treatment is 41 % of the pie, proposers in the earnings treatment offer 53 %. It is also interesting to note that only one offer between 25% and 40% is rejected by the responders, which is very unusual compared to empirical evidence from standard ultimatum games. Although rejection rates remain constant across treatments, the results of a regression analysis show a statistically significantly lower rejection rate in the entitlement treatment compared to the baseline scenario. Carr et al. argue that responders might be less willing to punish proposers for lower offers because they do not want to destroy their self-created value.

The following experiment is in line with the previously mentioned research but also introduces a new method of creating a sense of entitlement in ultimatum games. In contrast to Carr et al. (2013) and many other papers, both, proposers as well as responders, contribute to the pie by earning money within the same treatment. The responder's contributed amount of money is, however, al-

ways bigger than the contribution of the respective proposer and the difference between the earnings varies between the different pairs.
In this way the experiment is meant to explain whether and to what extent the creation of entitlements, for proposers as well as for responders, influences the perception of fairness on behalf of the participants.

3. Experimental Design

3.1 Baseline Treatment

In the baseline treatment (BT) a standard ultimatum game is played, primarily for control purposes. All players are randomly selected as proposers and responders and matched in pairs afterwards. It is then the proposer's task to offer any amount of the pie to the responder. The pie size is 100 monetary units (MU) and exogenously determined. The responder now has the choice to either accept or reject the offer. In case of acceptance, the responder receives the amount of money offered whereas the proposer gets the rest of the total amount. In case of rejection, neither of the players receives anything.

3.2 Earnings Treatment

The earnings treatment consists of two stages. All players are able to earn money at the first stage. Afterwards, at the second stage, the ultimatum game is played.
In order to create a sense of entitlement, the players have to solve 12 different math and logic problems to earn money at the first stage. The players have 20 seconds to solve each problem and the only technical aids allowed are pen and paper.
For every problem correctly solved, the players are given one point. The one exception is an estimation task which serves as a tie-breaker and can therefore have values between zero and one. Based on the received points, a ranking is created which is used for the allocation of roles and for calculating the respective amount of money each player can earn.
If a player is ranked among the best 50%, he is automatically assigned the role of a responder, whereas players with a rank in the lower half of the overall ranking are chosen to be proposers. With an exogenously determined pie size of 100 MU and N players, the respectively earned monetary units per player are calculated using the following formula:

$$MU_i = 100 - \left(\frac{100}{N+1}\right) * Rank_i$$

The players are matched in pairs in the following way: The responder ranked No. 1 is matched with the proposer with rank N. The responder ranked No. 2 is matched with the proposer with rank N-1 and so on. As a consequence, responders have always earned more monetary units than their matched proposers but the difference declines with decreasing ranks. This method also ensures that the amount to be divided up remains constant at 100 MU across all matched pairs. This allows for a better comparison between the pairs as well as the different treatments. Table 1 illustrates the matching methodology using an example with 8 players.

Afterwards the ultimatum game is played at the second stage. Before making their decisions, both, responders and proposers, are informed about their earnings and the respective earnings of their matched counterparts. Consequently, each player has complete information about how many monetary units he himself and his counterpart contributed to the pie.

Rank	Role	MU
1	Responder	88.9*
2	Responder	77.8
3	Responder	66.7
4	Responder	55.6
5	Proposer	44.4
6	Proposer	33.3
7	Proposer	22.2
8	Proposer	11.1

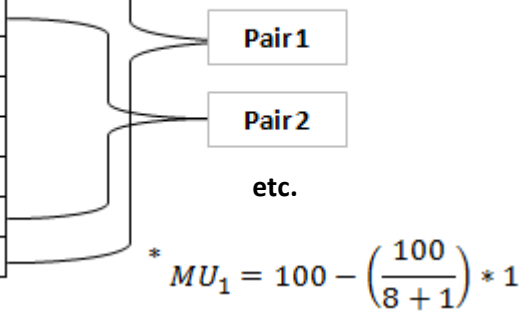

Table 1: Illustration of matching methodology

4. Procedures

The experiment was designed in the seminar "Experimental Economics" at the University of Passau and programmed as well as conducted with the software *z-Tree* (Fischbacher, 2007). The experiment was carried out in the computer labs of the university faculties of economics and informatics from June 11th until June 13th 2014. Altogether 15 sessions, with 6-16 participants each, were conducted. All sessions, lasting about 20-30 minutes, consisted of this experiment and another one designed by a fellow student. In order to avoid possible order effects, the order of the experiments was changed in every session. Although participation was voluntarily, 154 students attended the experiments. Thus, 77 observations in pairs were gathered of which 38 were collected in the baseline treatment and 39 in the earnings treatment. Although the participating students came from different academic disciplines, the majority of participants studied Business Administration/Economics (27.96%), Informatics/Internet Computing (16.59%) and Cultural and European Studies (16.71%).

Each session started with an instruction, read out loud by one of the experimenters, and ended with a questionnaire containing questions on age, sex, academic discipline and whether or not the participant knew his matched partner. The instructions at the start as well as instructions during the game were formulated as neutral as possible in order to avoid framing effects. The exact procedures and instructions for the subjects are listed in the appendix.

5. Hypotheses

As stated before, in this experiment the objective is to find out whether and to what extent the creation of entitlements, for proposers as well as for responders, influences the perception of fairness and thus the behavior of the subjects. Therefore it is natural to compare the results of the earnings treatment (ET) against the results of the baseline treatment (BT), focusing on differences in proposer offers and rejection rates.
Based on these considerations, the following hypotheses shall be tested:

Hypothesis 1 (H1): Offers are higher in the ET since proposers recognize the higher entitlements of the responders and the risk of negative reciprocity increases.

Hypothesis 2 (H2): Reflecting the varying difference in earnings across pairs, offers in the ET decrease with increasing entitlements of the proposers.

Hypothesis 3 (H3): Assuming that the responders' willingness to punish offers perceived as unfair outweighs the hesitance to destroy self-created value, rejection rates in the ET are higher than in the BT.

Hypothesis 4 (H4): Based on the theory of negative reciprocity, rejection rates increase with higher responder entitlements.

6. Experimental Results and Analysis

Table 2 provides the descriptive statistics for both treatments. 76 subjects participated in the baseline treatment, whereas 78 subjects took part in the earnings treatment. Recalling the theoretical predictions from section 2.1, it is obvious that the results deviate considerably from the Nash equilibria predicted by classical game theory. Instead of offering nothing, proposers offer an average of about half the pie across treatments with only one occurred "zero offer" in the ET. The picture is similar when it comes to responder behavior. With rejection rates being substantially higher than 0% in both treatments, subjects do not act in line with standard theory.

Treatment	N	Mean Offer	SD Offer	Rejection Rate
BT	76	46.24	12.29	18.42%
ET	78	50.21	23.06	30.77%

Table 2: Aggregated descriptive statistics

6.1 Proposer behavior - Hypothesis 1

Considering the mean offers provided by Table 2, H1 can be confirmed. On average, proposers in the BT offered an amount of 46.24 MU, whereas the mean offer in the ET increased to 50.21 MU. Figure 1 provides the cumulative distribution of proposer offers across treatments. The results

show that the number of offers exceeding 50 MU is higher in contrast to the BT where only one single proposer offered more than half the pie. According to the Wilcoxon (Mann-Whitney) test, this difference is statistically significant with a p-value of 0.0167.
Supporting H1, offers in the ET are more evenly distributed than in the BT, reflecting the varying differences in entitlement across pairs. Only 26% of the proposers offered an equal split of the pie, while the same offer occurred 55% of all cases in the BT. The wider variance of offers is also underpinned by the standard deviations with values of 12.29 in the BT and 23.06 in the ET.
Interestingly, compared to Carr et al. (2013), where only responders were able to earn money, the average proposer offer is lower in this experiment. This indicates that it is indeed relevant for the proposer's decision whether or not he is entitled to at least a small share of the pie.

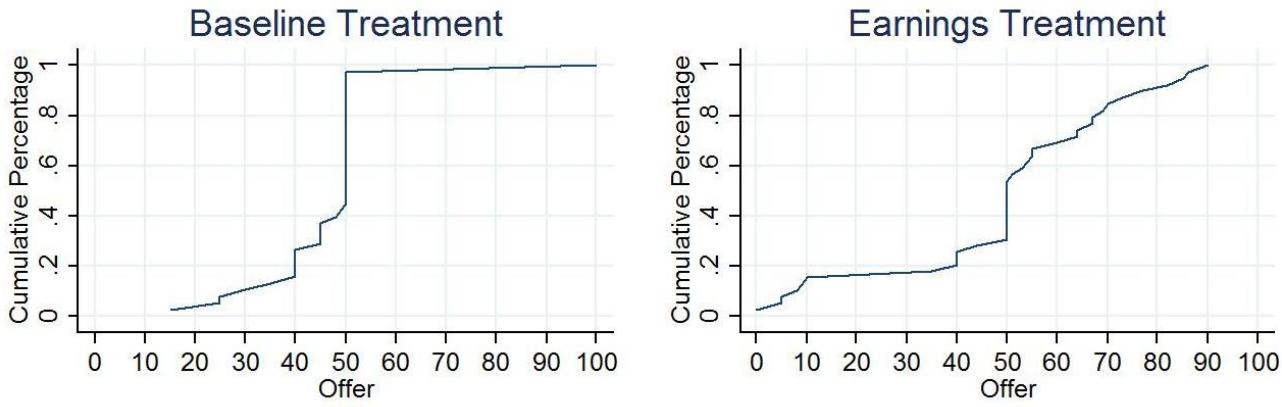

Figure 1: Cumulative distributions of offers

6.2 Proposer behavior - Hypothesis 2

Based on the findings of section 6.1, it is obvious that the introduction of earnings based entitlements has an impact on the proposers' behavior. In order to examine this impact more closely, H2 shall be tested.
Due to the matching methodology introduced in section 3.2, responders have always earned more monetary units than their matched proposers. That is why proposers have per se a lower entitlement than responders. But since the difference in entitlements declines with increasing ranks of the proposers (see Table 1), one might assume that proposers with lower earnings tend to make higher offers than proposers with higher earnings. Based on this assumption, proposer offers should decrease with increasing entitlement.
Figure 2 illustrates proposer offers in relation to entitlements. Although proposers with earnings between 40 and 50 tend towards offering an equal split, there is no clear trend supporting H2. Interestingly, the scatter plot shows that the variance of the offer size increases with decreasing entitlements. Especially offers from proposers with rather low earnings are widely spread within a range of 5 and 90.

In contrast, offers from proposers with entitlements slightly below 50 are concentrated in the range of 40 and 60. This indicates that subjects with higher entitlements seem to acknowledge the legitimate claims of responders whereas that is only partially the case for proposers with lower entitlements. Thus, proposers are more likely to make "fair" offers if they are entitled to a higher share of the pie anyway.

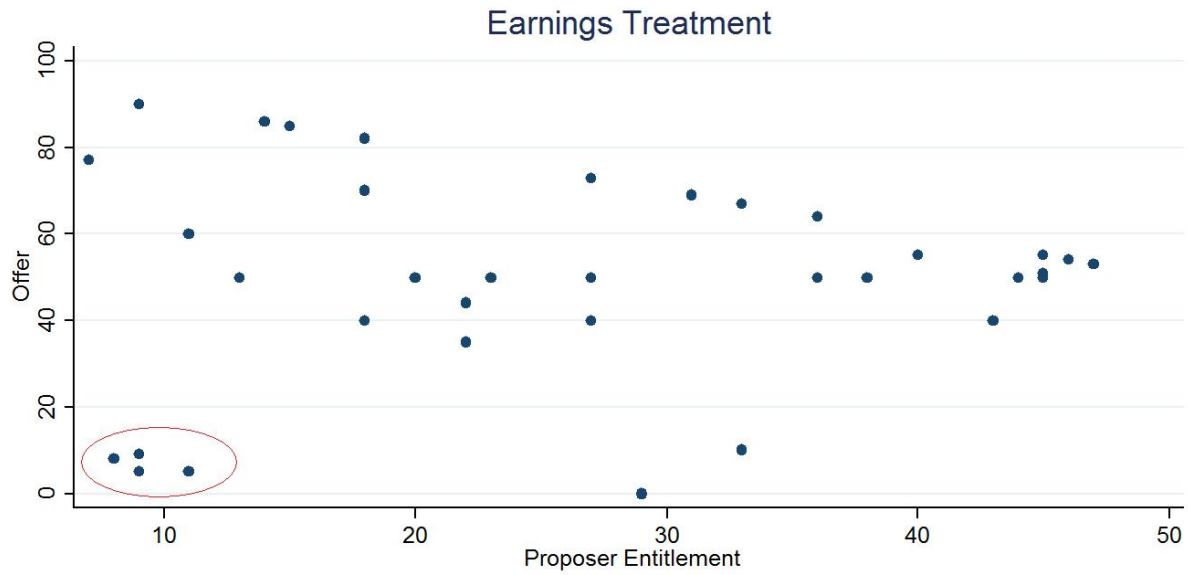

Figure 2: Distribution of offers for entitlements

As expected, based on the findings above, the Breusch-Pagan test for heteroskedasticity is positive (p-value = 0.0071). Therefore, robust standard errors are used for the linear regression analysis in Table 3. Conditional on order, gender and age, the first column shows an insignificant beta coefficient (0.168) for entitlement, thus refuting H2. Only a second regression, where supposed outliers (marked in red in Figure 2) are removed from the dataset, shows a significant negative beta coefficient (-0.532) which supports the assumed relation between offer size and entitlement.
Interestingly, the negative coefficient for the age variable is statistically significant at a 95% level of confidence. This indicates that the offer size decreases with a higher age of the proposer. Hence, younger subjects in the ET seem to offer higher amounts of money than older proposers.
However, considering the entire dataset, results are not robust enough to confirm H2, which therefore has to be rejected. Although some of the proposers seem to acknowledge the legitimate claims of the responders by offering amounts of up to 90 MU, this is not always the case.

	(1) offer	(2) offer
Entitlement	0.168	−0.532*
	(0.50)	(−2.49)
Order	4.067	9.276
	(0.48)	(1.50)
Male	2.668	7.224
	(0.33)	(1.41)
Age	−2.360	−3.024*
	(−1.66)	(−2.67)
_cons	97.68**	134.8***
	(2.81)	(5.25)
N	39	35

t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Table 3: Regression results for offer size

6.3 Responder behavior - Hypothesis 3

Despite the higher average offer, one would expect rejection rates to increase in the ET since proposers often refuse to fully recognize the legitimate claims of the responders. In fact, only 31% of the proposers made an offer which was equal to the entitlement of the respective responder. However, increasing rejection rates will only occur if responders are willing to destroy self-created value in order to punish proposers for offers perceived as unfair. Recalling the matching methodology, this is particularly interesting since responders always contributed more to the pie than proposers.

According to the rejection rates provided by Table 4, H3 can be confirmed. Despite the higher average offer, 30.8 % of offers were rejected in the ET, while only 18.4% of responders rejected the offer in the BT.

Focusing on offers below 50 MU, this difference becomes even clearer. Here the rejection rate increased by 26.1 percentage points to 63.6%. Thus, responders in the ET are more likely to punish "unfair" proposer behavior, even if that implies destroying self-created value.

This is supported by the fact that even 18% of offers higher than 50 MU were rejected in the ET. However, if offers in that context are still below the responder's entitlement, the rejection rates climbs up to 31.3%. This clearly demonstrates how the responders' perception of fairness changed across treatments. Even though proposers still have more bargaining power and offers are higher or equal to 50 MU, about every third responder rejects the offer if it is lower than his entitlement. In contrast, only 5% of offers in the same range are rejected in the BT.

Compared to to the responder produces treatment of Carr et al. (2013), the rejection rate is about 10 percentage points higher in this experiment. That is of course partly due to the lower average offer, but one might also assume that responders are more likely to reject an offer if they are not solely responsible for the production. Hence, the emotional bond between responders and a self-created value seems to be less strong in this scenario.

Treatment	Total	Offer < 50	Offer >= 50	Entittlement > Offer >= 50
BT	18.4%	37.5%	5.0%	
ET	30.8%	63.6%	18.0%	31.3%

Table 4: Rejection rates across treatments

The question that remains is whether the different rejection rates across treatments are significant. According to Fisher's exact test, there is no statistically significant relationship between the treatments and rejection rates (p-value = 0.252). A probit regression analysis with decision as dependent variable (Accept=1; Reject=0), provides similar results in Table 5 (column 1). Although the probability of accepting an offer decreases in the ET, hence the probability of rejection increases, the estimated coefficient for the treatment variable is not statistically significant with a p-value of 0.281.

	(1) Decision	(2) Decision
Treatment	−0.394 (−1.08)	
Offer	0.0415*** (3.65)	0.0450** (2.74)
Age	0.0112 (0.17)	0.0110 (0.11)
Male	0.352 (0.93)	−0.232 (−0.33)
Order	0.591 (1.45)	1.847 (1.95)
Entitlement		0.0205 (0.80)
_cons	−1.607 (−1.03)	−3.618 (−1.19)
N	77	39

t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Table 5: Regression results for decision

6.4 Responder behavior - Hypothesis 4

As mentioned before, proposers often do not observe the responders' property rights legitimized by higher earnings. Thus, one could expect that especially responders with higher entitlements are more likely to reject an offer than those with lower entitlements.

Table 6 provides rejection rates for different ranges of entitlement. Although rejection rates vary across the different ranges, there is no evidence supporting H4. When comparing the entitlement ranges 50-59 and 90-100, for instance, rejection rates increased only slightly. Hence, there is also no evidence for a stronger bond between the created value and the responders with relatively high earnings compared to rather poor performing producers.

Another probit regression is used to test the hypothesis. The results presented in Table 5 (column 2) show that there is no significant relationship between the size of entitlement and the probability of rejection, even when controlling for offer size (p-value = 0.425).

As a consequence, H4 has to be rejected. Recalling the findings from section 6.2, this is a very interesting fact since there is no evidence that proposers with lower earnings offered, on average, significantly higher amounts than those with higher entitlements.

Entitlement Range				
50-59	**60-69**	**70-79**	**80-89**	**90-100**
37.5% (8)	22.2% (9)	50.0% (8)	11.1% (9)	40.0% (5)

Figures in parentheses are the actual number of observations in that range.

Table 6: Rejection rates for ranges of entitlement

7. Limitations

The first and most important limitation is the absence of monetary payoffs. Since the experiment was part of a university seminar and all experimenters were students, no real money could be used for incentivizing the participants. This could have lead to a less self-interested and a more cooperative behavior among the subjects, thus distorting the results.

Moreover, the experiment was conducted together with another experiment by a fellow student. The second game was a prisoner's dilemma, extended with a communication channel. Although the sequence of the games was changed every session to avoid order effects and partners were mixed after the first game, possible learning effects still might have affected the subjects' behavior.

The next limitation applies mainly to Hypothesis 1 and 2. While it is possible to evaluate the gathered data regarding the size of offers across treatments, it is rather difficult to analyze the intentions of the subjects. In this context, a questionnaire might have helped to better understand whether decisions were primarily driven by a preference for fairness or anticipation of negative reciprocity.

Finally, almost all participants were students of the University of Passau. Despite the fact that they majored in different academic disciplines, the subject pool is obviously not a representative sample of individuals.

8. Concluding Remarks

The objective of this paper was to investigate how the introduction of entitlements changes the fairness norms and thereby the behavior of the subjects in an ultimatum game. By analyzing the experimental results, the following key findings can be derived:

First of all, proposers offer more money if responders are entitled to a bigger share of the pie than themselves. In addition, the whole distribution of offers is shifted to the right. Even offering more than half of the pie is no longer unusual. However, it is hard to say whether this is primarily due to the fact that proposers recognize the legitimate claims of the responders or rather fear a higher probability of rejecting low offers.

Interestingly, the proposer's decision of whether or not make a "fair" offer seems to strongly depend on his own range of entitlement. Offers corresponding precisely to the legitimate claims of responders mainly occur, when the proposers are entitled to almost half of the pie anyway. In contrast, this is more rarely the case for proposers with rather low entitlements since they have a low expected payoff by offering the "fair" amount. It seems as if considering entitlements while making an offer becomes more likely with better performance. This is an indication for opportunistic behavior. Thus, decisions seem to be driven primarily by strategic aspects and less by a change in perception of fairness. In other words, the motivation of people to adhere to the concept of entitlements in a decision environment may not be necessarily attributed to a preference for fairness, but also to self-interest.

However, with regard to the increasing rejection rates across treatments, there is clear evidence for a shift in fairness norms. The vast majority of responders with legitimate claims to a higher share of the pie are no longer willing to accept offers generating a lower payoff than an equal split. Even offers above 50% are frequently rejected if they are below the responder's entitlement. This is an indication for a stronger distinctive sense of justice among the subjects which leads to an increased willingness to punish proposers for offers perceived as unfair. Feeling entitled to a certain amount of money and not receiving it seems to have a stronger impact on the responders' decision than the fact that self-created value is destroyed. Thus, disregarding legitimate entitlements in a decision environment may lead to negative reciprocity and thereby to suboptimal outcomes.

In conclusion, the results reveal that the introduction of earnings based entitlements has a divergent influence on the fairness norms of responders and proposers. Whereas the latter seem to have a more flexible principle of fairness which is often overcome by self-interest, especially when facing low payoffs. Responders attach more importance to adhering to the fairness norms induced by the sense of entitlements, resulting in a decreasing tolerance for offers perceived as unfair and thereby to costly punishments.

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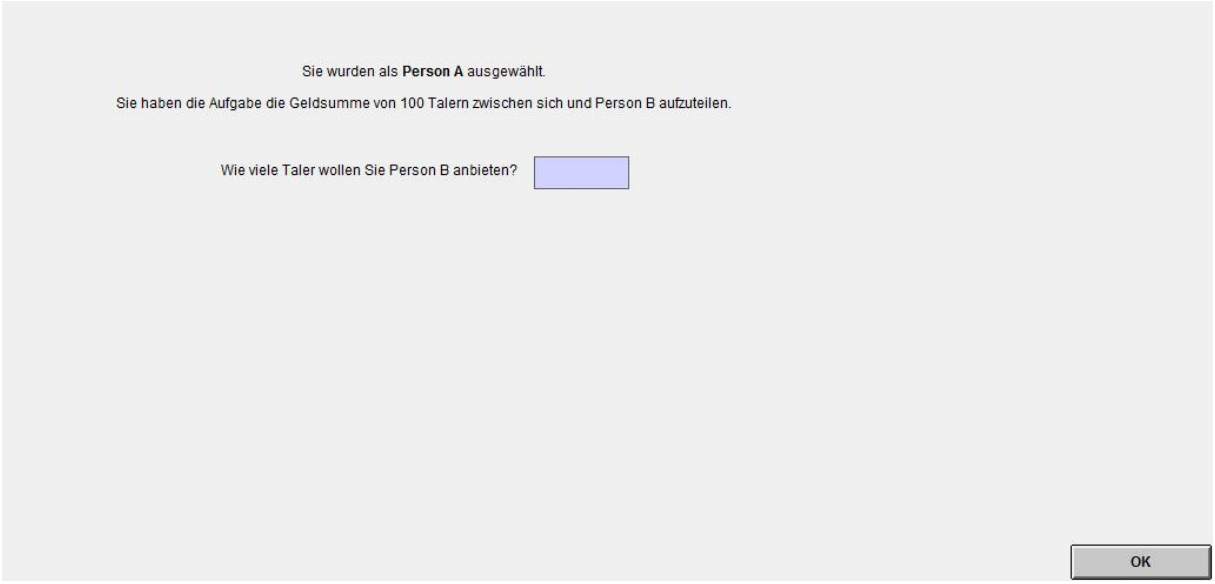
Appendix

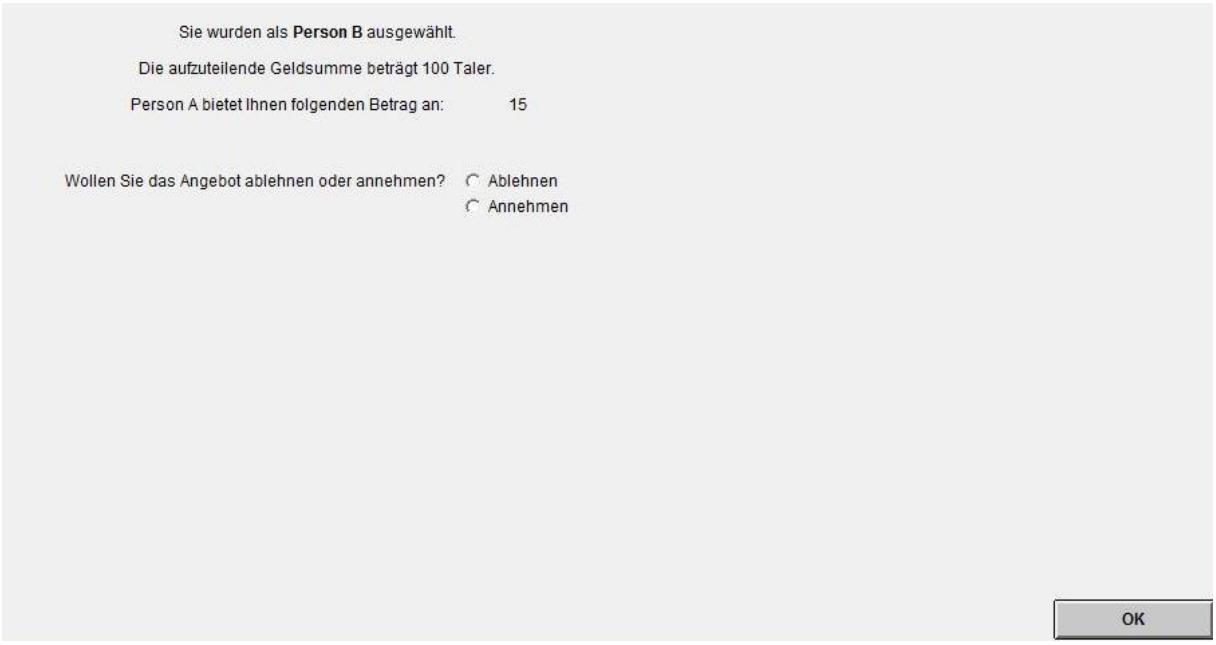
I. Screenshots – Baseline Treatment

Screenshot 1: Welcome Screen (similarly for ET)

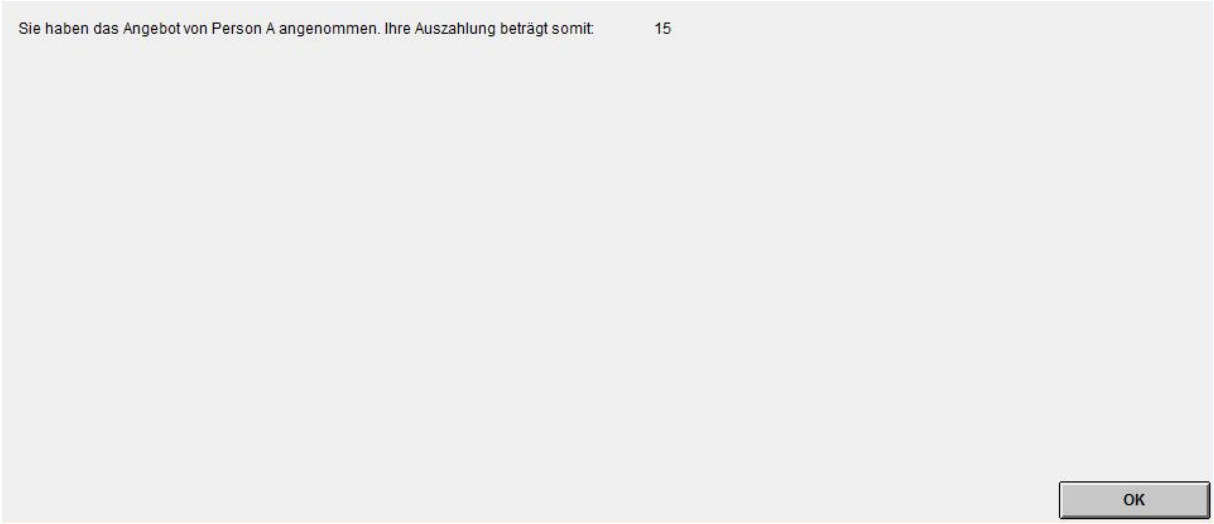
Screenshot 2: Instructions



Screenshot 3: Offer (Proposer)

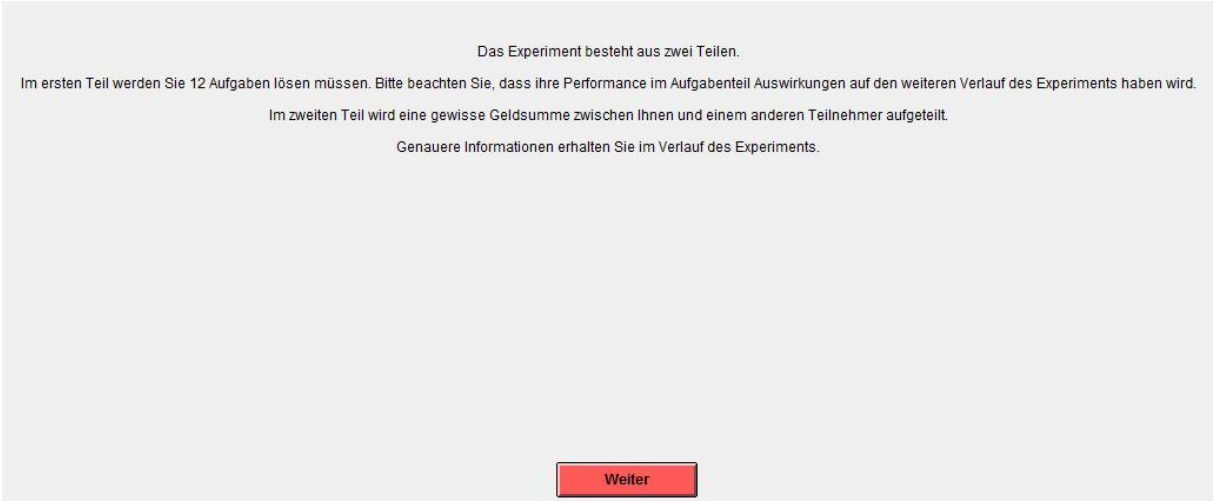


Screenshot 4: Decision (Responder)



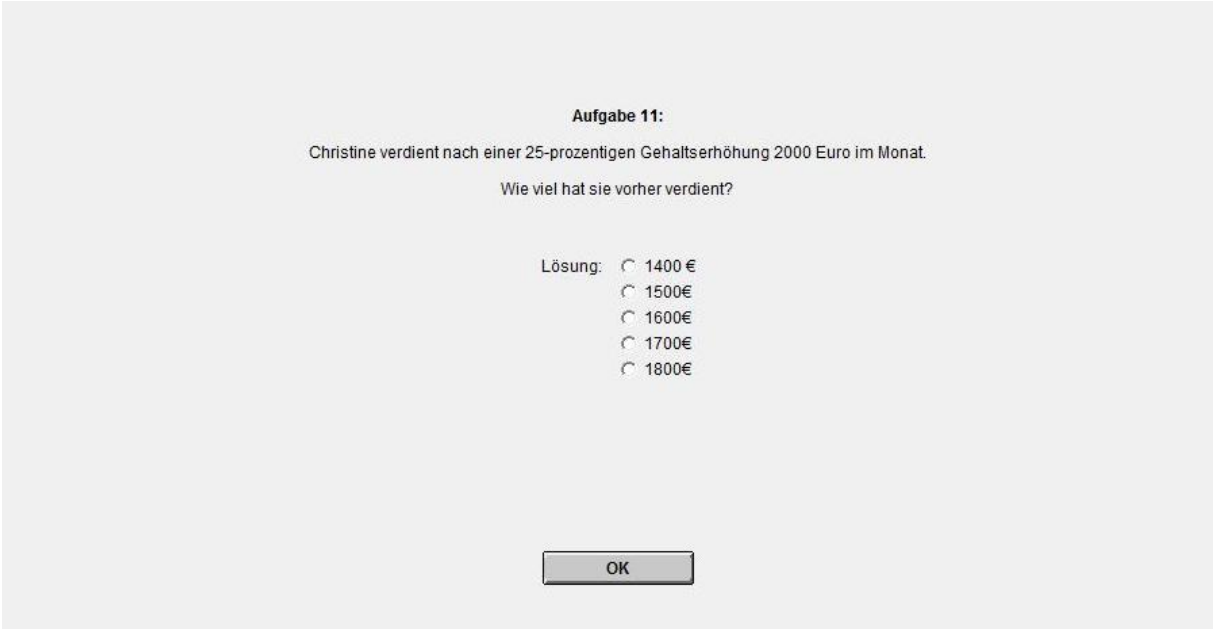
Screenshot 5: Payoff (Responder; similarly for Proposers)

II. Screenshots – Earnings Treatment

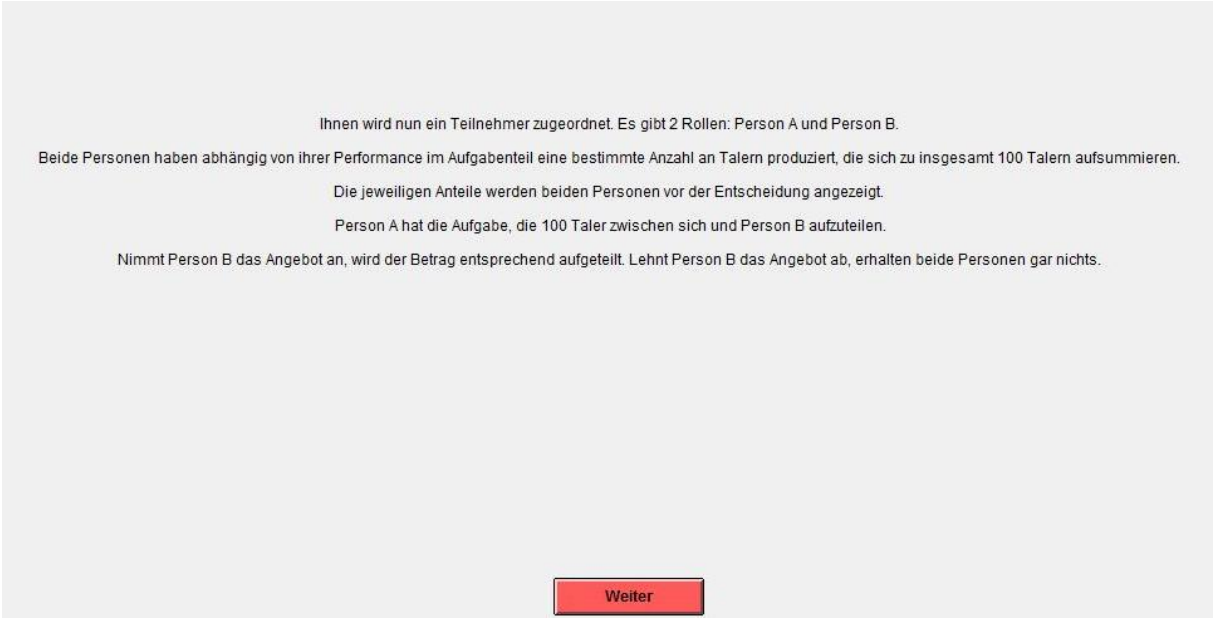


Screenshot 6: Instructions Part 1

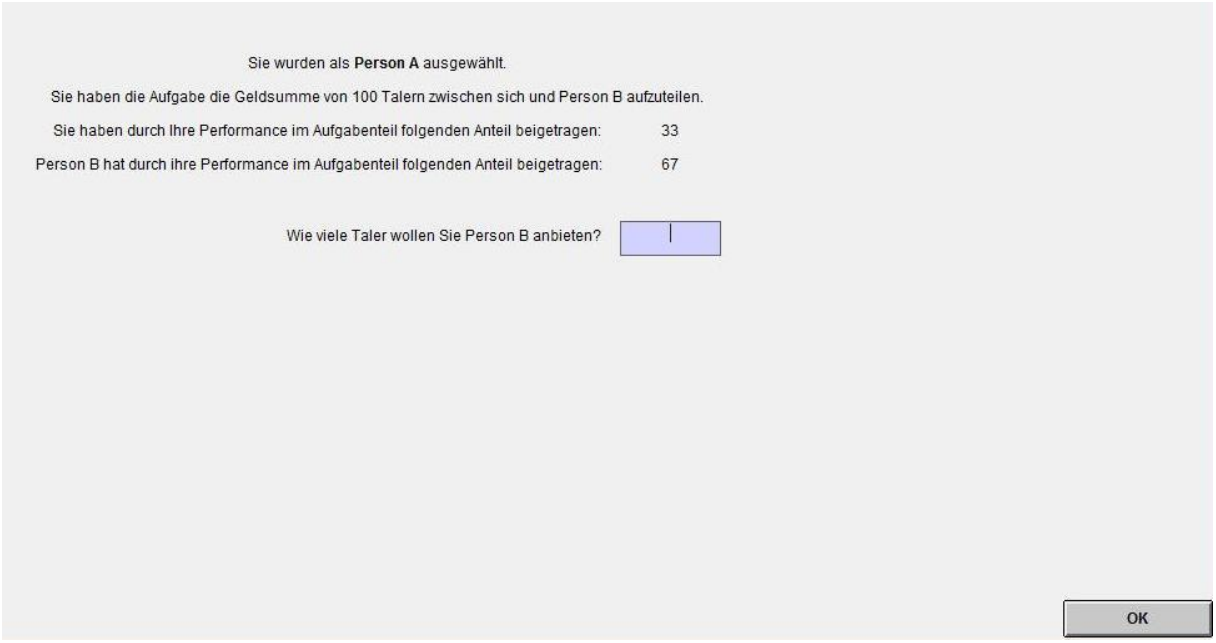
Screenshot 7: Instructions Part 2



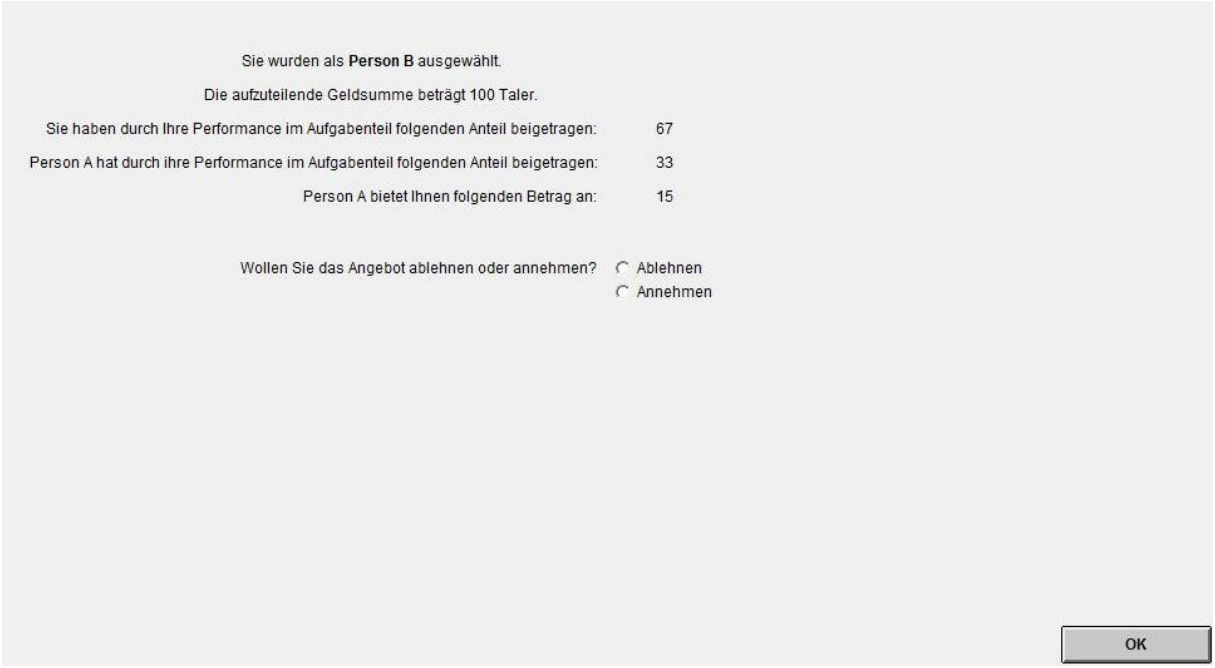
Screenshot 8: Example of a math problem



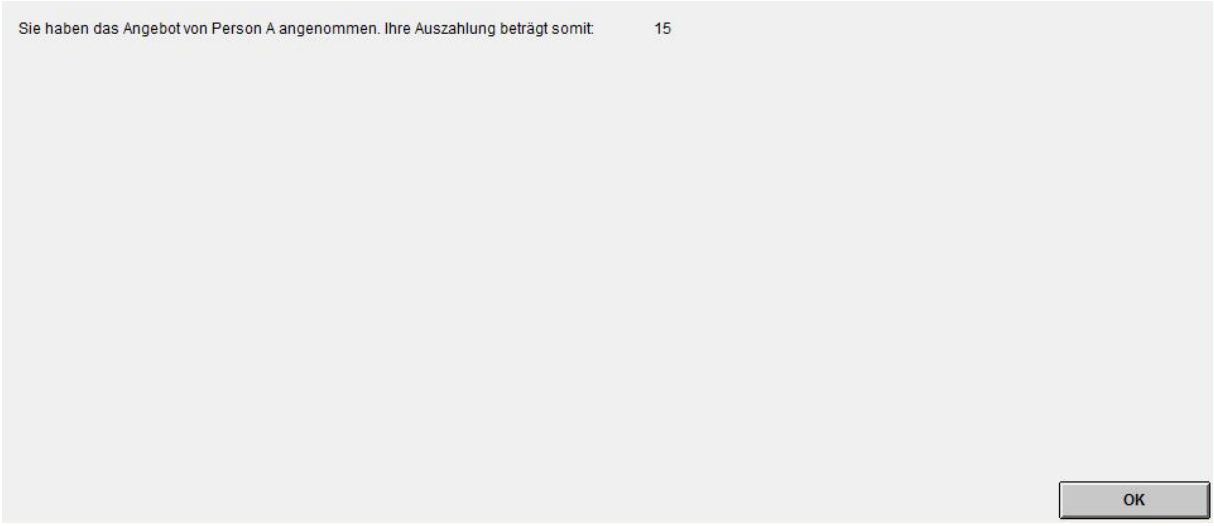
Screenshot 9: Instructions Part 3



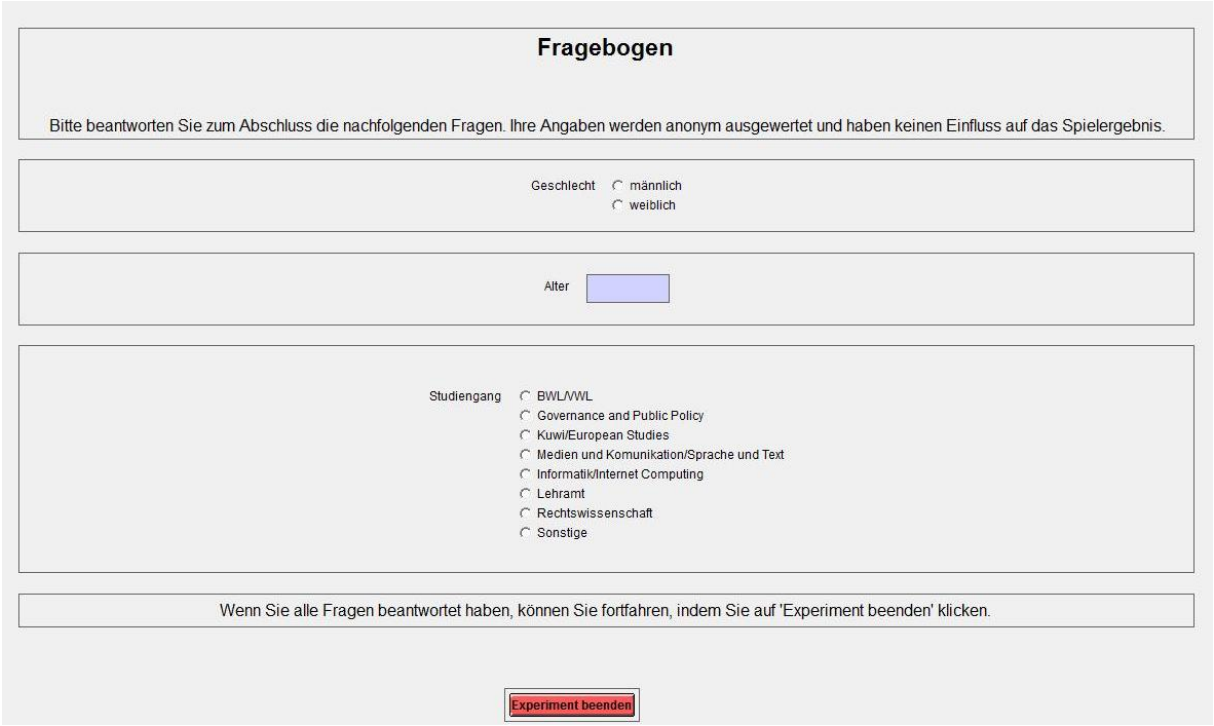
Screenshot 10: Offer (Proposer)



Screenshot 11: Decision (Responder)



Screenshot 12: Payoff (Responder, similarly for Proposer)



Screenshot 13: Questionnaire