Colloquium: Research in Experimental Economic Topics

Summer Semester 2013

EFFECTS OF BELIEFS ABOUT INTENTIONS IN THE ULTIMATUM GAME

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Submitted

July 5, 2013, Munich

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I. INTRODUCTION

"It is hard to give a decision when it is not the thing given, but its meaning, which has to be considered; though what is given is the same, yet if it be given under different circumstances it has a different value. A man may have bestowed a benefit upon me, but unwillingly; he may have complained of having given it; he may have looked at me with greater haughtiness than he was wont to do; he may have been so slow in giving it, that he would have done me a greater service if he had promptly refused it. How could a judge estimate the value of these things, when words, hesitation, or looks can destroy all their claim to gratitude?" (Lucius A. Seneca, *De Beneficiis*)

One of the assumptions of the traditional economic theory is that individuals are selfish and are driven entirely by self interest. However, experiments showed that many people exhibit social preferences - rather than caring exclusively about their own outcome, they care directly about the outcomes of others. Social preferences have a significant impact on behavior in the bargaining setting. Particularly in the Ultimatum Game people are motivated by concerns for fairness and reciprocity and examine the intentions of the opponent and whether her offer is fair or not. Accordingly, they will take different actions: many of them will decide to punish the opponent by taking revenge and reducing her payoff and some will not. With his experiment Levine (1998) showed that people are seeking for fairness when in his experiments players who felt unfairness tried to reduce the opponent's payoff, no matter if it made them better or worse off than the opponent herself. Next to others (Rabin 1993; Dufwenberg and Kirchsteiger 1999, Falk and Fischbacher 1999; Bolton and Ockenfels 2000), his model shares the property that some people are assumed to have a preferences for fairness.

When it comes to the opponent´s intentions, experiments of intentions (Blount 1995, Offermann 1999) indicated that subjects tend to punish the opponent, if they observe an unfair action or if the opponent seems to be mean or selfish. Theories of intentions predict that in games in which no intentions are expressed there will also be no punishment. In order to notice the effect of not having any intentions, the choices had to be made randomly by computers in the experiment. These have not had intention, were naturally unbiased and generated random offers.

Blount (1995) applied the idea of intentions to the UG. In her treatment the Proposers' offers were not chosen by human subjects but instead randomly selected by a computer. Therefore, on this condition even a low offer did not signal any (bad) intention since subjects couldn't attribute any intentions as selfishness or greediness to the Proposers. When the rejection rates in the classic UG were compared with those of the new condition the data revealed that the acceptance rate for given offers in the computer treatment is much higher than in the regular treatment. However, even in the absence of intentions some subjects rejected extremely disadvantageous offers. Together with other theories the prediction is that there will be rejections, but to a much lower extent as in classic UG due to the fact that when humans are making low offers, intentions appear and judgment comes into the picture when making choices. That gives rise to rejections.

Another experiment with computers generating offers was conducted by Offermann (1999) who found out that subjects are more likely to reduce the payoff of their opponent when the choice was intentional and hurtful for them compared with a treatment in which the computer was to make the hurtful choice.

The experiments discussed above demonstrate that intentionality and beliefs about it are central explanation of rejections. They give evidence for the importance of intentions in the UG and at the same time promote the new question and empirical testing of uncertainty with about the opponent´s intentions and identity of the opponent - human or computer. Since the computers as Proposers have, unlike humans, no intentions, emotions nor act unfairly with regard to the human Responder, the human subjects tend to avoid revenge or punishment knowing that the computer didn't act purposefully. This paper therefore intends to find out how rejection rates will change, when the identity of the Proposer is uncertain regarding the human Responder. We want to examine how the existence of uncertainty and the beliefs about the opponent´s intentions determine individual behavior knowing that the computer has no intentions but his offer is being replicated as one that was made already by a human being.

The paper is organized as follows. The next section shortly discusses the theory of the Ultimatum Game and our predictions and hypotheses. The second section presents the experimental design. Results are presented in the third part and the fourth part gives a short summary, criticism and discussion.

II. THEORY AND HYPOTHESES

The Ultimatum Game was first studied and introduced by the literature by Gueth, Schmittberger and Schwarze (1982). It is the most well-known game in which reciprocity is being applied. In this two-person sequential-move bargaining game, the Proposer is allocated an amount of money, which we normalize to 1, and has to divide it between herself and the Responder, i.e., $0 \leq c \leq 1$. If the latter accepts the suggested division, the resulting payoff is 1-c for the Proposer and c for the Responder. If he rejects the offer the payoff is zero for both. The outcome according to the subgame perfect Nash Equilibrium is $\{c = y; \text{accept for } y > 0\}$. Critical components of the belief of this equilibrium are the argument of rationality and utility maximization. The rationality assumption states that a person prefers to get any amount of money to nothing at all. The game-theoretic prediction for this game is straightforward: If both players act rationally in the sense that each prioritized her own profit then the Proposer will expect the Responder to accept any offer that has a positive share of the endowment. Therefore the Proposer should offer the smallest possible share and leave most of the endowment to herself.

The UG has been studied intensively using different amounts of money and different designs. As a result, it can be claimed that the actual human subjects' behavior is very different from the rationality assumption. Thaler (1988) and Roth and Erev (1995) covered experiments of the UG and found out that most offers tend to be at around 50 percent of the endowment and offers that strongly differ from an equal division are usually rejected. Gueth, Schmittberger and Schwarze (1982) reported modal offers of exactly 50 percent, offers that are close to this percentage were never rejected whereas the rejection rate for offers below 20 percent are high. These results show interesting differences between experimental results and game-theoretic predictions.

Trying to find the reason for the motivation behind the rejection of offers, we encounter large evidence that the majority of people are motivated by observations of fairness and reciprocity.

Fairness models like the equity models of Fehr and Schmidt (1999) and Bolton and Ockenfals (2000) show that some people have not only preferences for the payoff, but also preference for fairness. These models are built on the assumption that subjects dislike inequality.
In the Bolton and Ockenfals model inequity averse players are concerned about a fair relative share (1/n, n=number of players in the game) of the total payoffs. When a player receives less than the fair relative share, she tries to increase her share and the other way around.
The model of Fehr and Schmidt also predicts that strong inequity aversive people show reciprocal behavior. In this model inequality averse players are concerned with the payoff differences between themselves and the other player. If the payoff of player i differs from that of player j, she tries to reduce the payoff difference between herself and j.

Both of these models might be incomplete as they do not take intentions into account. According to their approach, only the outcome, i.e. the offers, explains reciprocal responses and does not consider to how the offers may be perceived depending on the intentions involved. The pattern might look different, when observing whether the Responders care about the Proposer´s intentions.

The purpose of our experiment is to study the way by which Responders' behavior in the UG responds to changes in the environment when intentions and uncertainty about those intentions are being introduced. How do Responders behave in an environment where they cannot be sure if their opposite players' behavior is intentional or random?

First we aim to find out whether there is a real contradiction between the rationality claim of game theory and the real observed behavior in the UG (Responders reject low offers). Secondly, we abandon the classical setup of the UG and add a new experimental tool to examine the effect of the environment when the Proposers now include humans and computers. The objective of this experiment was to explore the way human players' behavior changes as a function of beliefs about the intention of the opponent - a human or a computer.

Our experiment provides an opportunity to examine to what extent the uncertainty about the presence of computers, i.e. no intentions, influence the choices individuals make. To our knowledge, there is no study that examines it and previous studies could only point out the importance of intentions when it was known that the opponent is a device that generates random offers.

1. **Hypothesis**: We expect to observe lower rejection rates, when some of the Proposers are computers, compared to only human Proposers.

In our experiment we anticipate that there will be differences in rejections rate between only human Proposers and computers that are generating offers as Proposers. We predict that subjects who are playing also with computer Proposer might believe that there is no point in judging the computer and take revenge and therefore there will be a lower rejection rate of offers.

2. **Hypothesis**: Proposers who are playing alongside human or a computer Proposers will make smaller offers than those who only play with humans.

Human Proposers might offer smaller offers when they know that computers are around and that Responders might not reject the offer as frequently when there is a lack of “bad” intentions so the Proposers tend to make more unequal selfish offers.

3. **Hypothesis**: Responders who exhibit high social preferences tend to reject unfair offers, when playing with humans and when playing with a human or a computer.

Responders who possess high social preferences and low self interest are more motivated to reject unfair offers, because they might have conditioned their behavior on the perceived intentions of others.

III. EXPERIMENTAL DESIGN

A. Subjects

In total, 102 participants took part in five laboratory sessions at the Munich Experimental Laboratory for Economic and Social Sciences (MELESSA). In each session there were between 12 and 24 subjects. Drawn from a pool of approximately 1,200 and invited using the organizational software ORSEE (Greiner, 2004), the participants were mostly students who came potentially from all fields of study and have not necessarily have had contact to behavioral experiments before. In practice, a share of 15.7 percent were students studying Economics and roughly 11.6 percent have had participated in a MELESSA experiment for the first or second time.

B. Procedure

The participants were randomly assigned to computers at the MELESSA laboratory room. The eventual payoffs depended on the subjects’ chance and decisions which the participants were able to make independently. The choices were entered in the interface of the experimental software z-tree (Fischbacher, 2007). Each participant faced the same three parts of the experiment in the exact same order. Firstly, the Ultimatum Game was conducted and repeated for five rounds. For this, the participants were randomly assigned one of two types. Only for this part of the experiment they took either the role of the “Responder” or the “Proposer”. As a next step, each Responder was paired with a Proposer. The subjects did not know with whom they were paired. The pairs were reassigned within a group of 8 participants after each of the five rounds to guarantee three independent observation units per session, also called matching groups. Thus, there is a high chance of meeting each Proposer only one time. The Proposer of each pair was allocated 100 points to distribute among the Responder and herself. He was free to make any even numbered offer between 0 and 100 points to the Responder who subsequently decided whether to accept or reject this offer. In case of rejection, neither of them received any points. If the Responder accepted, she received the proposed share of the 100 points, whereas the Proposer received the remaining ones.

During the second part of the experiment, in the following called “Public-Good-Game”, the participants essentially faced a Prisoners-Dilemma situation. This game is only played once. They were randomly arranged in to pairs. Each participant decided on the division of 20 points. These points could either be transferred to one´s private account or to the collective account. The sum of contributions of both parties to the collective account is multiplied by 0.8. Both subjects benefited equally of the amount of points in the collective account, meaning that each of them was paid out the amount of points of this account. These points, converted to €, and the points withheld composed the profit of the second part of the experiment. The Public-Good-Game is designed in order to measure the willingness for cooperation of each participant.

In the third part of the experiment, namely the “Ring-Test” (Brosig, 2002, Offerman, 1996), the participants randomly formed pairs again without knowing their partner´s identity. Though they did not interact with each other directly, the participants´ payoffs were determined by 24 decisions that they made themselves between two options and by the 24 decisions that were made by their partner. Each choice meant potential gains and losses of points for the decider herself as well as the other subject who made the exact same choices simultaneously. The total profit from this part was the addition of the amounts of points chosen by the participants for themselves and the points being received from the partner. The points were converted into € by the factor 0.1. How many points someone granted to the partner was used as a measure for the importance of her well-being. Each decision concerns a social option, sharing points with the partner, sometimes even to one´s disadvantage, and an antisocial option, granting the partner nothing or even taking points from her. The own-other-payoffs of each decision can be scattered in a two-dimensional space and are allocated around a circle with the origin (0,0). As a result of the 24 options chosen, a vector starting at (0,0) can be calculated. The participants were then classified according to the angle of the vector: between 67.5 and 112.5° were classified as “altruistic”, a vector between 22.5° and 67.5° as “cooperative”, between 0 and 22.5° or between 337.5 and 360° meant “individualistic” and angles between 292.5° and 337.5° assigned the characteristic “competitive” to the participant. In order to organize the participant into a binary system, each to whom the characteristic “cooperative” has been assigned and whose motivational vector exceeded 7.5, is certified high “social preferences”. 7.5 is one fourth of the maximum length of the vector that indicates the strength of the assigned quality. In the following social preferences are also called “social value” or “social motivation”. At the end of the experiment session the participants were asked to fill in a standard questionnaire in order to gain information on sociodemographic features.

C. Treatment Variation

While the first and second session form the first treatment group, the second treatment consists of session 3, 4 and 5. There was a single variation introduced: For the Ultimatum Game two out of the eight subjects were replaced in one observation unit. These subjects hold the role of the Proposer. Instead of their proposal of points, a predetermined offer was proposed to the Responder during the Ultimatum Game. The new offers were actual offers of Proposers from the first treatment that had been chosen randomly in order to attribute differences between the results, in particular the acceptance rate, from both treatment groups exclusively to the treatment variation. The non-human Proposers in the second treatment are referred to as “Computers” hereinafter. The participants were aware of their existence and knew that the Computers take over former proposals of human subjects. They also had knowledge about the 50 percent chance of being paired with a Computer.

1. Treatment Group	2. Treatment Group
Human Responders vs. Human Proposers	Human Responders vs. 50% Human and 50% Computer Proposers

D. Payoffs

The overall experiment took between 45 and 60 minutes. The participants could earn points of which 10 were converted to 1 € at the end of the experiment session. The main part of the experiment consisted of five rounds of the Ultimatum Game and lasted for less than 4 minutes in average. After the fifth round, one round of the Ultimatum Game was chosen randomly and eventually the participants were paid the earned amount. This part´s payoff amounts to approximately 2.70 € for each participant, with only little differences between sessions and treatment groups. All in all, the participants received an average payment of 14.25 €, including an additional payment of 4 € for showing up on time.

IV. RESULTS AND DISCUSSION

A. **Results**

As a result of the experiment, 560 data points, 480 data points without the Computers, were available for statistical analysis. We can make use of 14 independent observation units. Our main interest lies in the rate of offers that were accepted by the Responders during the Ultimatum Game.

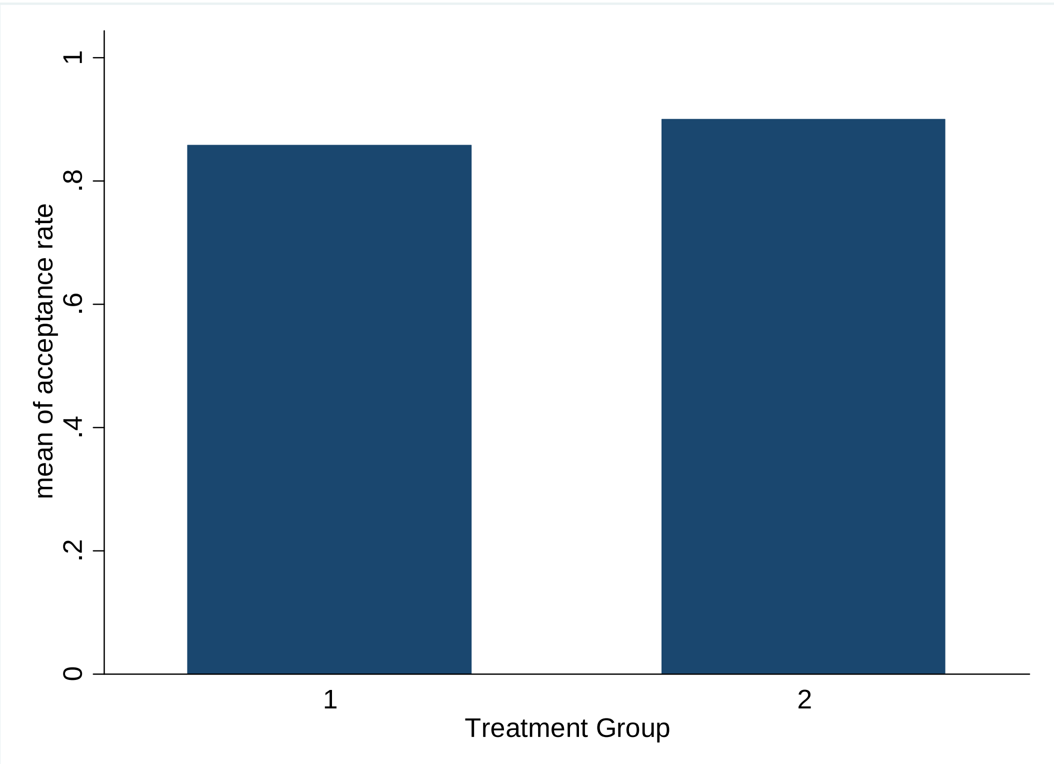


FIGURE 1 (Percentage of accepted Offers by Treatment Group)

According to our first hypothesis, there should be differences found in the two treatment groups, because the subjects in the latter one might have developed a particular belief. Since there is the chance of meeting an non-human Computer without intentions and emotions in the second treatment group, the Responders might believe that there is no point in judging their opposite subject or taking revenge for a supposedly unfair proposal of points. That is why they should accept offers in the second treatment group more often. On the first glance, this assumption seems to be confirmed with respect to the mean of the acceptance rates: In the first treatment roughly 85.8 percent of the Responders accepted the Proposer´s offer, whereas in the second treatment it was 90.0 percent (Figure 1).

In the next step, we apply the two-sample Wilcoxon rank-sum test to evaluate whether there are significant differences in the acceptance rates of both treatment groups. The test shows that the acceptance rate in the first treatment group is equal to the acceptance rate in the second treatment group (p-value = 0.2789 | z-value = -1.083). This is a strong indication that our first hypothesis is false. Evidently, this does not help our theory: The Responders might not have changed their decision-making behavior and therefore probably might not have developed certain beliefs about the Proposers´ intentions in the second treatment group, either.

Whether the offer is accepted or not, is highly dependent on the size of the offer itself. The comparison shows that the means of offers in the first treatment group, 42.7 points, is not much different from the average of points offered in the second treatment group, namely 40.8 (Figure 2). Based on the 14 independent observation units, the two-sample Wilcoxon rank-sum test, verifies the presumption of equal means: The Proposers´ offers in both treatment groups do not differ significantly (p-value = 0.4371 | z-value = 0.777). This fact implies that the difference in the acceptance rates is unlikely due to different offers in the treatment groups exclusively.

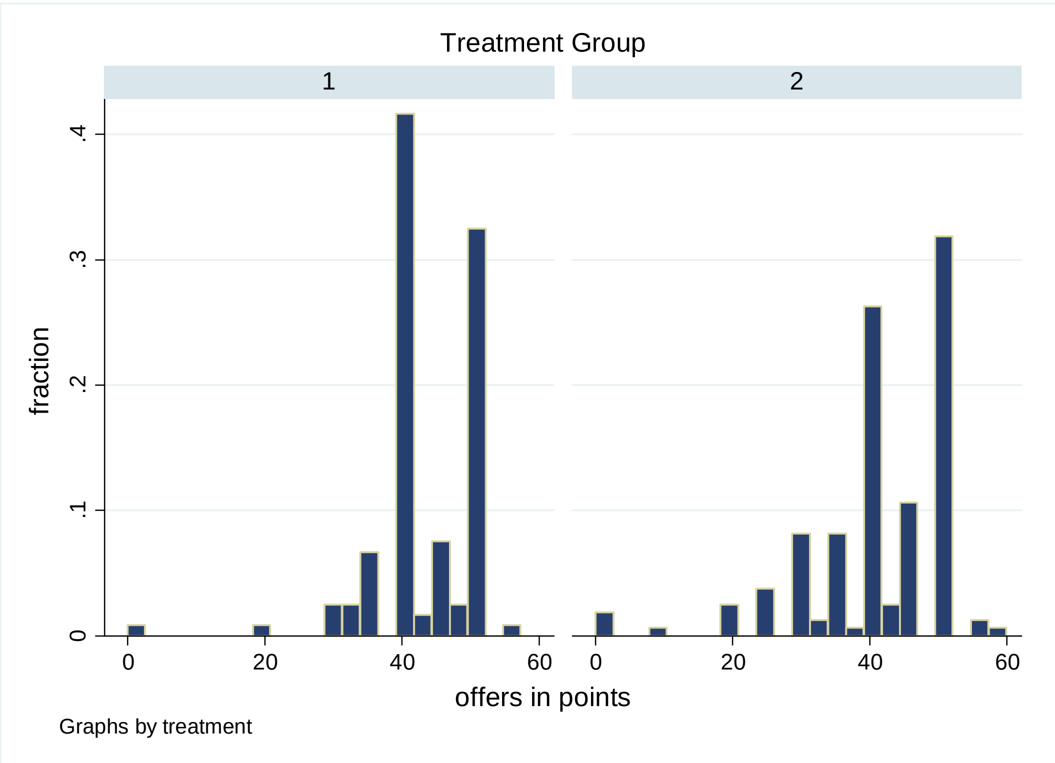


FIGURE 2 (Distribution of Proposers´ Offers by Treatment Group)

Hence, the Responders might consider the Proposers´ offers to be potentially "neutral" and purposeless after all. On the other hand, the human Proposers in the second treatment group cannot have offered a lower amount in average than the ones in the first treatment group. This circumstance leads to the assumtions that the Proposers have not anticipated the Responders´ belief about potential neutrality of the proposals and reduced their offers to benefit from the higher acceptance rate. According to these findings, our second hypothesis cannot be supported.

Could it be that a particular share of Responders denies the offer above-average? Considering only this particular share, the differences between the treatment groups could appear to be significant. If so, our first hypothesis would be approved after all. Presumably, there is a group of Responders who show stronger cooperation and higher social responsibility. We expect subjects with this characteristic to value the well-being of other subjects and to have high social preferences, meaning that they behave cooperatively in the Ring-Test. Furthermore, we assumed that they tend to contribute more points to the collective account in the Public-Good-Game, thus put more trust into the opposite subject than others. Our third hypothesis states that particularly Responders who possess high social preferences have a high incentive to deny supposedly unfair offers in the Ultimatum Game. These subjects who have a share of 32.08 percent in our sample might develop an even more negative feeling about unequal splits of the 100 points in the Ultimatum Game since such an offer opposes their social attitude and disappoints the natural trust in the fairness of the partner. We had a closer look on the relationship between the social value and the contribution in the Public-Good-Game. The correlation between the social value and contributions higher or equal to 10 points (0.1048) gives a first hint that there is a positive connection. Scattering the contribution in points and the angle of the social-motivation vector of the Ring-Test, the fitted values suggest the same: There is a slightly positive marginal

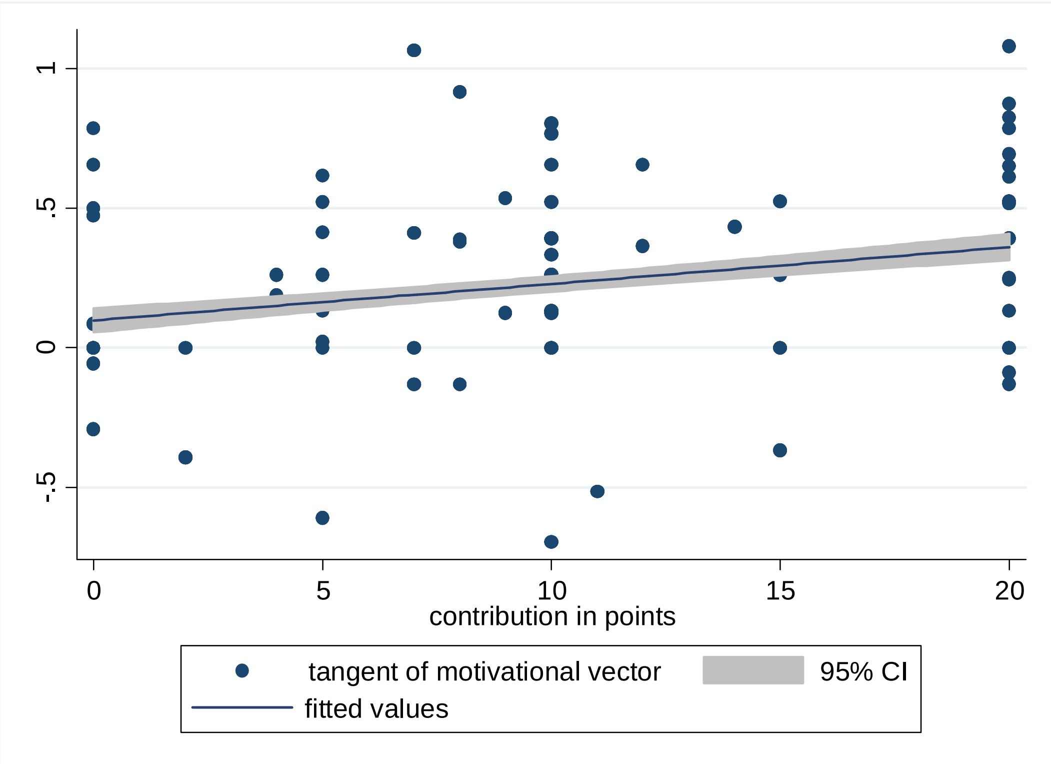


FIGURE 3 (Contribution-Social Preference Relationship, 95%-Confidence Interval)

effect observable (Figure 3; “cooperative”, or rather high social value, corresponds to a tangent from 0.41 to 2.41, whereas “individualistic” corresponds to a tangent of -0.41 to 0.41). Equally, the two-sample Wilcoxon rank-sum test gives evidence that the contribution of subjects with high social value is different from those of subjects with low contribution (p-value = 0.0240 | z-value = -

2.256). This fact suggests that the subjects who contributed a high amount of points might have done so due to their high social value and did not just behave rationally, intending to maximize their monetary gains. This insight partly supports our third hypothesis. Now, the image that we create above about this particular group of cooperative Responders seems plausible.

Even if we are able to isolate high-social-value Responders, we still cannot predict whether they are more likely to reject the offers than others. Again, we apply the two-sample Wilcoxon rank-sum test, based on the 480 observations: The acceptance rates between subjects with high social value and low social value do not differ significantly (p-value = 0.2344 | z-value = 1.189), showing that the incentive of the average Responder to deny the proposal could be equal to that of an Responder with high social value. On the other hand, the results may be less consistent, because the observations are interdependent. Besides**,** the acceptance rates of only high-social-value Responders slightly differ between the treatment groups. It seems possible that the effect of the Responders´ social preferences has only a significant influence on the acceptance rate in the second treatment group as the behavioral difference between the average and the high social-value Responders could be larger only in the second treatment group. Unfortunately, a simple OLS regression model finds no evidence for this thought (Figure 4). Therefore, our findings do not offer support for our third hypothesis. Even after examining a particular group, we could not find any proof for contrasting beliefs between the treatment groups.

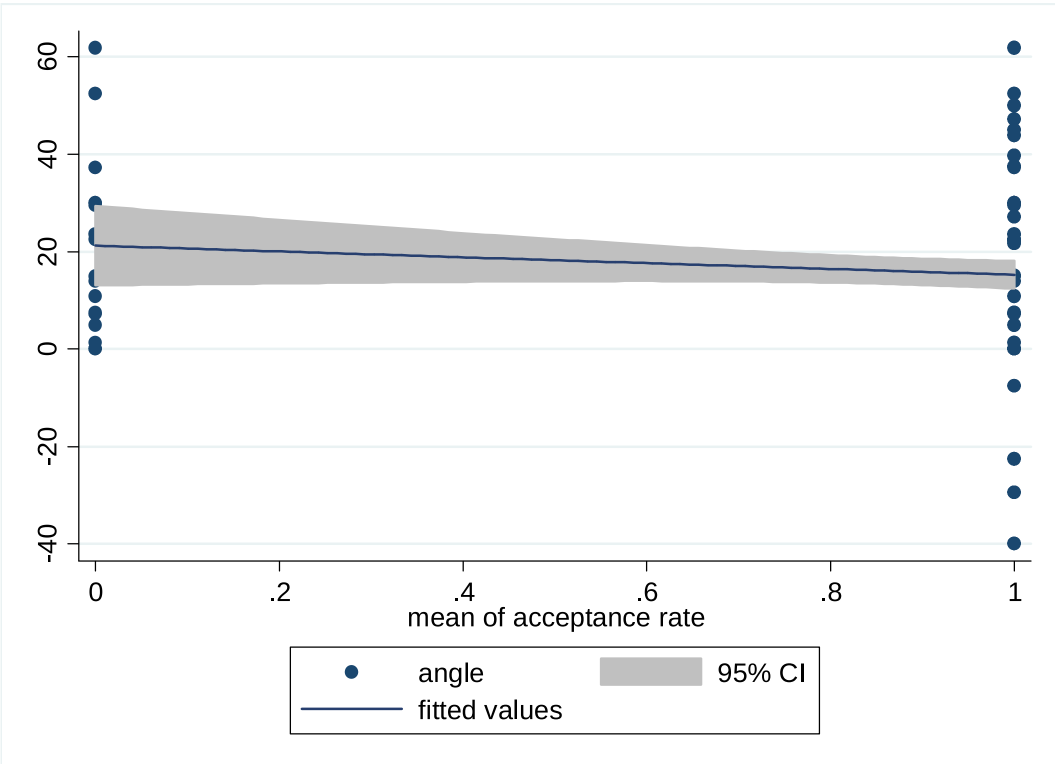


FIGURE 4 (Regression of Acceptance Rate on motivational Vector for Social Value, Model with Treatment Group 2 Data)

B. Regression Analysis

The previous tests gave us some hints, but did not offer certainty whether our first, essential hypothesis was true or false. As a consequence, we create several Probit regression models (Table) in which the estimate is the probability in percent for a Responder to accept the offer. Although it is a non-linear model, the coefficients are converted in order to display the marginal effects and the estimate variable equals the probability of the proposed offer being accepted by the Responder. Model I and II are based on 560 observations, whereas Model III to V use 480 observations, excluding the Computer data without information about social value, contributions in the Public-Good-Game and gender. Due to the interdependency of the single data points, we clustered on matching group level. Due to the controlled environment in which the experiment took place, we do not face Reverse Causality. With all convincing estimators included in Model V, we suspect to have no Omitted Variable Bias, so that we can presume causality between the estimate and the estimators. Model I shows that the treatment group alone makes no difference with regard to the acceptance rate. Only if one take the Proposers´ proposal into account in Model II, the treatment group becomes significant on the acceptance rate at the 5 percent level. This change makes believe that the treatment groups and the offers are interdependent in which the Proposers propose a lower amount in the second treatment. Thus, Model II suggests the second hypothesis to be true after all. Considering the offers, the treatment group variable has a positive effect, meaning that the likeli-

Dependent Variable: Responder´s Probability of Acceptance

Regressors	**Model I**	**Model II**	**Model III**	**Model IV**	**Model V**
Second Treatment Group	0.0409 (0.0327)	0.0827** (0.0363)	0.0998** (0.0431)	0.0952** (0.0406)	0.0917** (0.0414)
Proposed Offer in Points		0.0118*** (0.00284)	0.0130*** (0.00325)	0.0131*** (0.00322)	0.0129*** (0.00320)
High Social Value/Cooperative Behavior			-0.0512* (0.0295)	-0.0458* (0.0253)	-0.0457* (0.0257)
Contribution in the Public-Good-Game in Points				-0.00279 (0.00224)	-0.00237 (0.00210)
Gender					0.0242 (0.0253)

Robust standard errors in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$

TABLE - Probit Regression Analyses

hood to accept is 8.27 percent higher in the second treatment group. According to our first hypothesis, this fact meets our expectations. Furthermore, Model II shows that the proposed offer is highly significant at the 1 percent level. Its effect stays consistent, regardless how many other explanatory variables are added to the regression model. Additionally, the standard error is very small. Naturally, the effect of the offer is a positive one on the acceptance rate of the Responder: If she is offered a higher amount of points, she will be more likely to accept. Controlling for “gender” in the fifth model, this explanatory variable´s influence stays stable as expected. “Gender” has no effect on the likelihood of accepting the offer. Here again, a positive effect of the treatment group variable is at hand, meaning that offers made in the second treatment group are 9.17 percent more likely to be accepted. This fits perfectly to our first hypothesis. Offers are more frequently accepted, because “unfair” ones are not punished as often as in the first treatment group. The Responders developed the belief that the Computers have no intentions. On the other hand, Model III, IV and V support our third hypothesis only weakly. Evidently, the contribution in points has no remarkable influence on the probability of acceptance whatsoever. On the other hand, the influence of cooperative behavior or, with the phrase of this paper, high social value appears to be significant at the 10 percent level. In addition, the estimated effect is negative, meaning that subjects with high social value are 4.57 percent less likely to accept in both treatment groups. This could lead back to the lower probability of acceptance in the second treatment group. Overall, these regression models speak weakly in favor of the third hypothesis.

C. Discussion and Criticism

Overall, our analysis demonstrates that there lies some truth in our prediction. Particularly, the regression analysis has shown that this difference is not likely to be random, but leads back to the treatment variation and its effect on the beliefs of the Responders in each treatment group. To which treatment group a Responder belongs, defines the probability of her acceptance. Surprisingly, we were able to reproduce the results of the Ultimatum Game with only Computers as Proposers (Blount, 1995), although we implemented only a 50 percent share of Computers proposing offers. As we have observed during the experiment Responders anticipate the fact that Computers are non-human Proposers and develop certain beliefs, regardless of the uncertainty they faced. Due to the experimental instructions (Appendix) we can assure that these beliefs are not about how the Computers behave, but about their lack of motivation and intention. Because of this lack, the Responders in the second treatment group are more likely to accept the offer. They did not have any incentive to do otherwise, when facing a Computer, since suspect the incentive of denial to be connected to the motive of punishment or revenge for a supposedly unfair offer. Pairing Responders and Proposers for only in both treatment groups, we isolated the motives since the denial of offers could not be due to a long-term threat towards the Proposer, but only due to revenge for her unfairness. If these motives are diminished, as in the second treatment, the acceptance rate is supposed to increase, as it did in the experiment.

We also want to focus on the weaknesses of the experimental design. The subjects came from a homogenous group of students of whom some might have been familiar with the ultimatum and therefore chose an equal split. As a matter of fact, there was not much incentive for denial. Lacking a broader variation of offers, the acceptance rates are very high in both treatments. In addition, only six out of twelve Proposers were Computers in the second treatment group. The results might have had bigger impact, if there had been overall more subjects in total in order to have more observations allowing also more Computer-related observations. A larger share of Computers per matching group might also strengthen our treatment variation and make our results far more powerful. Nevertheless, we chose to create a lottery that assigned Computers by 50% chance, thus creating uncertainty for the Responders about the sort of Proposer they will face. Although it probably reduced the significance of the treatment variation, this uncertainty proves our first hypothesis to be even more consistent, because the causality between acceptance rate and treatment group exists in spite of our experiment design. One could even argue that by implementing uncertainty in the Ultimatum Game, its results become more relevant for the real economic world. It resembles the uncertainty that people might have about the intentions of their opponents, for example corporate negotiations.

IV. CONCLUSION

In this paper we examined the formal theory of the Ultimatum Game and models that exist so far in the literature of reciprocity, social preferences and intentions mainly in the UG by analyzing the behavioral response to beliefs about intentions when uncertainty exists.

We argue that beliefs about the intentions behind the outcomes are most relevant. If there is uncertainty regarding their existence the response, the rejection, will be slightly less intense. However even in a situation where there is a chance of intentions being present, subjects will continue to experience the outcome itself as an indicator for possible disadvantages in this particular situation and accordingly make a reciprocal response.

As we can see the UG´s solution by Game Theory differs from our results. We observe a decrease in rejection with higher offers and a slight increase of reciprocity, the acceptance rate, uncertainty exists to some extend regarding the available intentions.

V. APPENDIX

Welcome to the experiment and
thank you for your participation!
Please do not talk to other participants of the experiment from now on

General information on the procedure

This experiment is conducted to investigate economic decision making. You can earn money during the experiment. This will be paid to you privately and in cash following the experiment.
The entire experiment takes about 1 hour and consists of 3 parts. At the beginning of each part you will receive detailed instructions. If you have questions after the instructions or during the

experiment please raise your hand. One of the experimenters will come to you and answer your question privately. For simplicity we will use only the male form in the instructions.
During the experiment, you and the other participants are asked to make decisions. In parts, you will interact with other participants. That means both your own decisions and the decisions of other participants can determine your payment. Your payment is due to the rules which are explained in the following.
At the right upper corner of the screen a clock will count down while you are making your decisions. This provides an orientation on how much time you should need to make your decision. Of course, you can exceed the time if you need more time for your decision. Especially at the beginning of the experiment this could happen more often. The information screens where there are no decisions to be made will disappear after the time has run out.

Payment
In the first part of the experiments we do not talk about Euros but points. These will be converted into Euros at the end of the experiment. The exchange rate is

10 points = 1€
(1 point = 0,10€ = 10 Cents)

For arriving on time you will receive 4 € additionally to the income you will earn during the experiment.

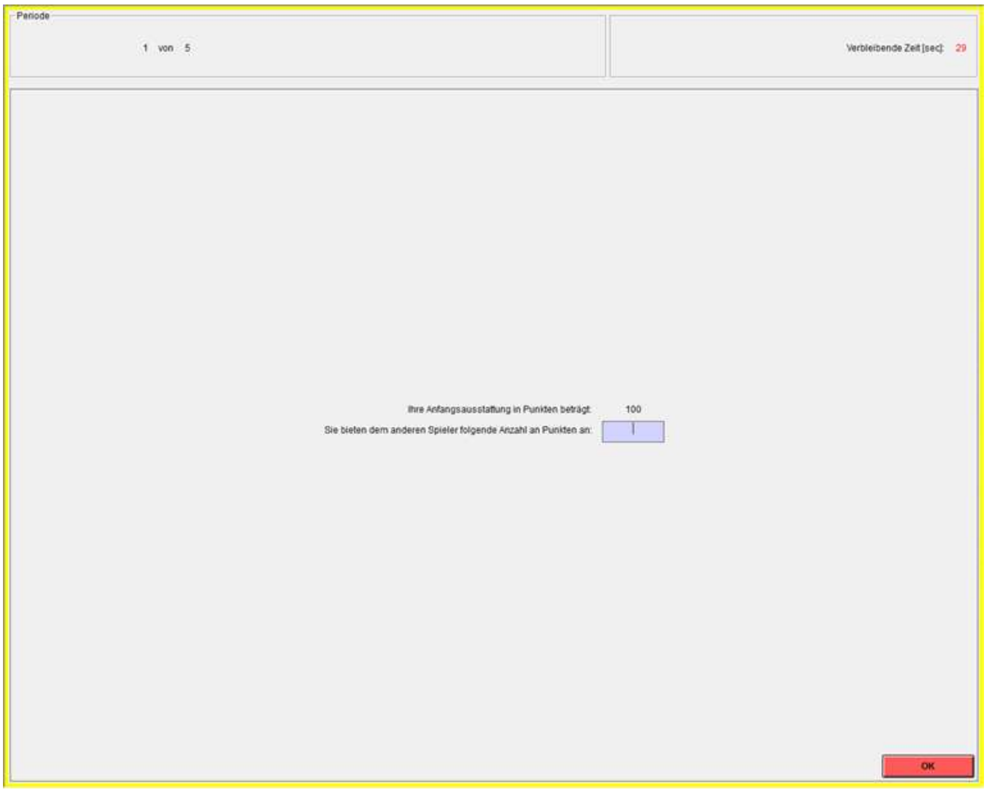
Anonymity
We evaluate all the data of the experiment only in aggregate form and never connect personal information to the data of the experiment. At the end of the experiment you have to sign a receipt for the payment. This only serves for the accounting with our sponsor. Of course, the sponsor does not receive any further experimental data.

Devices
At your place you will find a pen. Please leave it on the table after the experiment.

Part I

The first part consists of **5 rounds**. There are two types of participants, **type A** and **type B**. In the beginning 12 participants are randomly assigned to the role of type B and 6 participants to the role of type A. You will keep your role throughout all 5 rounds. A type A participant and a type B participant are randomly matched in each round and build a pair. Since there are more type B participants than type A participants, there is a **50% chance** in every round that a participant of type B is not matched with a human participant of type A but a **computer program** that takes over the role of type A and that was programmed to **imitate human behavior** from a former experiment. Type B participants are not informed whether they are matched with a human participant or with a computer program.

At the beginning of each round each pair receives **100 points** which have to be allocated to the two participants according to the procedure explained in the following. Type A will see the following screen (Figure 1):

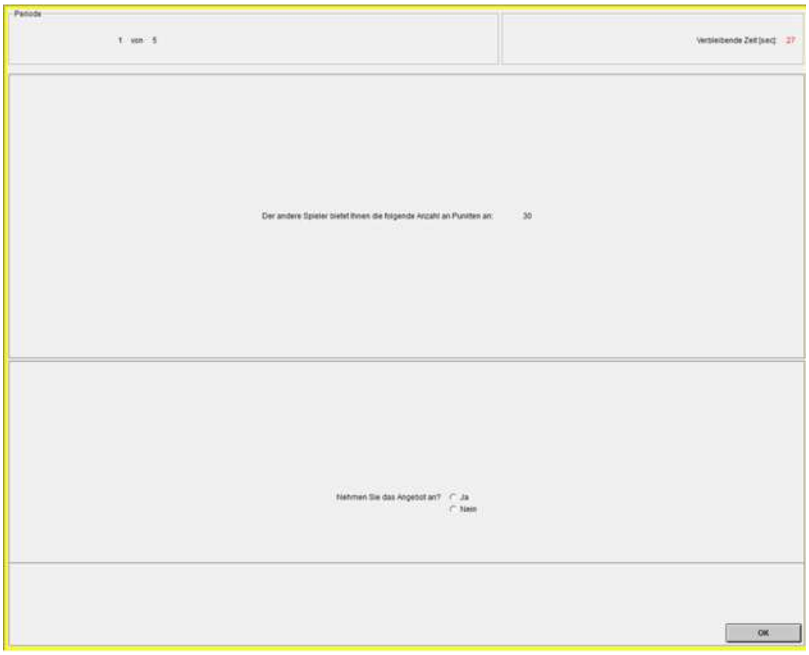


Type A can now decide how many of the 100 points he would like to **offer to type B**. He can offer any number between 0 and 100 points. For that purpose type A fills in the field in the center of the screen. Please note that you can only enter integers. Your entry is valid after you have pressed the red "OK"-button on the right bottom of the screen. The entry is then transmitted as **offer to type B**.

The difference between the initial 100 points and the offer is the amount that type A wants to keep according to his offer.

<u>Example:</u>
Type A would like to keep 70 points and offer 30 points to type B. Thus, he enters 30 into the field.

Should the type A assigned to a type B participant be the computer program (as described above) the program will make an offer to type B exactly like a human participant based on actual human decisions from former experiments.
After type A has made his decision type B can decide whether he accepts or rejects this decision. Type B will see the following screen (Figure 2):



In the upper half of the screen **the amount type A offers to type B** is displayed. In the bottom type B can choose whether to **accept** or **reject** the offer. For this purpose type B chooses either “Yes” or “No” and confirms this by clicking on the “OK”-button on the right bottom of the screen. Please note that the decision is final as soon as you pressed the “OK”-button.

If type B **accepts** the offer of type A, t**ype B will receive the offered amount and type a will receive the difference**. If type B **rejects** the offer both participants earn **0 points in this round**. In the upper example this would mean:

Type A has offered 30 points to type B. If type B accepts, type B receives 30 points and type A receives 70 points. If type B rejects both receive 0 points.

You will see the result of this round on the next screen which displays how many points you earned in this round. With this the current round ends and the next round begins until you have played 5 rounds. **At the beginning of each round each type A is randomly matched with a new type B.** The probability for a type B to be matched with a computer program **is still 50 % in each round**. Please note that you keep you r role (type A or type B) for the entire part I.

At the end of part I the computer will choose one of the 5 rounds randomly and with equal probability. The points earned in this round will be converted due to the exchange rate stated above and paid to you in the end of the experiment.

Part II

In the second part of the experiment pairs are built randomly from the individuals in the room (with two group members each). You will not learn with which participant you build a pair, neither during nor after the experiment. The other participant neither receives any information about you r identity. Each group member has to decide about the **division of 20 points**. You can either transfer these 20 points to your **private account or entirely or partly to a group account**. Every point you do not transfer to the group account automatically stays in your private account.

Income from the private account:

You receive one point for every point you transfer to the private account. For example:

If you transfer 20 points to your private account (and therefore nothing to the group account) your income will be exactly 20 points (from your private account). If you transfer 6 points to your private account your income will be 6 points from this account. Nobody but you will receive points from your private account.

Income from the group account:

Both members of the group will profit **equally** from the points you transfer to the group account. At the same time you also profit from the points the other group member transfers to the group account. The income of each group member from the group account is determined as follows:

Income from the group account = Sum of the contributions to the group account of both group members x 0.8

For example:

The sum of the contributions of both group members equals 10 points. Thus, you and the other group member each receive 10 x 0.8 = 8 points from the group account.

Total profit:

Your total income from part II is the sum of the income from your private account and the group account:

Total income = Income from the private account + Income from the group account

= (20 – contribution to the group account) + (0.8 x sum of the contributions to the group account)

Your total income from this part will subsequently be converted into Euros, at which 10 points = 1 Euro and then be added to your income from part I.

Part III

In the third part of the experiment pairs are built randomly from the individuals in the room. You will not learn with which participant you build a pair, neither during nor after the experiment. The other participant neither receives any information about your identity. In this part you will make 24 decisions. In each you can choose between two options - option A or option B. Each option involves a positive or a negative payment in points for you and for the other individual (individual 2). Individual 2 answers exactly the same questions. Your total income from part III depends on your own decisions and the decisions of individual 2.

An example of a decision:

	option A	option B
your payment	10.00	7.00
payment individual 2	-5.00	4.00

- If you choose option A you will receive 10 points and 5 points will be deducted from the other individual. If individual 2 also chooses option A, he will also receive 10 points and 5 points will be deducted from you. Thus, you would earn 5 points in total (10 points from your own choice minus 5 points from the choice of individual 2). Individual 2 would also earn 5 points (10 points – 5 points).
- If you choose option B and individual 2 chooses option A you would earn 2 points in total (7 points from your own choice minus 5 points from the choice of individual 2). Individual 2 would earn 14 points (10 points + 4 points)
- Further combinations (you choose A and individual 2 chooses B or both individuals choose B) are analogous to this example.

Altogether you will make 24 decisions. Your total profit is determined as follows: The 24 values for "your payment" from your decisions are added up. Additionally you will receive the 24 values for "payment individual 2" which the other person decided upon. The sum of these two sums determines your total profit in points and will be converted into Euros as follows: 10 points = 1 €.

Please note: You will not receive any information about the individual decisions of the other person in your group. Your will only learn your own profit from your own decisions, your profit from the decisions of individual 2 and your total profit from part III.

After this part the experiment ends. Your total profit is now the sum of your incomes from part I, II and III plus the 4€ for your arrival on time. Your total profit will be displayed to you on the screen.

Afterwards we will ask you to answer some questions about personal details honestly and completely. As soon as all participants will have completed the answers to these questions we will call you up separately and in random order. Your earnings will then be paid to you privately and in cash.

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