Value Perception in the Ultimatum Game: A Blinded Randomized Trial

Jan FIALA – Oldřich STARÝ* – Martina FIALOVÁ** – Adéla HOLASOVÁ* – Tereza MEJZLÍKOVÁ*** – Július BEMŠ**

Abstract

In a blinded, randomized Ultimatum game we study the decision rates using two different reward systems. We discuss the individual value perception and explain why we decided to test a non-monetary reward against the standard low stake monetary reward. We demonstrate that the value systems based on two different, inconvertible currencies lead to different decision rates in the same population. We provide the details of our single blind randomized protocol and discuss other protocol modifications designed to demonstrate the variability of the offer and/or response rates in the Ultimatum games. We provide our concept of rational, non-rational and irrational components contributing to the decision making process in different accord depending on the individual perception of the reward value and confront our experimental findings with the key assumptions provided by other authors.

Keywords: *ultimatum game, value, utility*

JEL Classifications: C70, C90, D80

Introduction

The Ultimatum game (Güth, Schmittberger and Schwarze, 1982) is a classical bargaining game in behavioral economics. It has been played by tens of thousands of subjects in various environments, using more or less standard conditions

* Jan FIALA – Oldřich STARÝ – Adéla HOLASOVÁ – Július BEMŠ, Czech Technical University in Prague, Faculty of Electrical Engineering, Department of Economics, Management and Humanities, Technická 2, 166 27 Prague 6, Czech Republic; e-mail: jan.fiala@fiala-partners.cz; staryo@fel.cvut.cz; holasade@fel.cvut.cz; bemsjuli@fel.cvut.cz.

** Martina FIALOVÁ, Charles University in Prague and Motol University Hospital, 1st Faculty of Medicine, 3rd Department of Surgery, V Úvalu 84, 150 06 Prague 5, Czech Republic; martina.fialova@fiala-partners.cz.

*** Tereza MEJZLÍKOVÁ, National Institute of Mental Health, Department of Psychology, Topolová 748, 250 67 – Klecany; Czech Republic; tereza.mejzlikova@nudz.cz.

and setting. In this game, Player 1 (the proposer) gets an endowment from the experimenter, typically in a form of money. The proposer decides how to split such endowment between herself and Player 2 (the responder). The responder, knowing the initial endowment value and complete rules of the game, will then decide whether or not to accept the proposal. If the proposal gets rejected, both players will not receive anything. If the proposal gets accepted, each player will earn their respective proposed share. Each player`s strategy influences the outcome in a critical way. In a standard setting, the game is anonymous and does not repeat. The players should not meet in person, should establish no social relation and should know the game would not repeat. Anonymity is indeed a critical requirement as the social influence on the decision making process turns out to be very important.

According to the normative decision making theories (Bell, Raiffa and Tversky, 1988), used in theoretical economics and game theory, Player 2 should accept any proposal higher than zero (because the rejection of such an offer would result in less than maximum utility). As Player 1 can effectively induce this strategy, she should rationally offer the smallest possible share of the pie, because again, anything else would lead to less than maximum utility for herself. Player 1 offering the smallest possible amount (share) and Player 2 accepting this offer indeed represent a subgame perfect equilibrium in the game. Practically, all experiments (Güth, Schmittberger and Schwarze, 1982) under the standard protocols, however, document that an initial transfer around 20% of the endowment gets rejected about half of the time and a typical transfer from Player 1 to Player 2 ranges from 40% to 50%. The average offer reaches 40% (Oosterbeek, Sloof and van de Kuilen, 2004) and is almost always approved. Offers even lower than 20% are rare and almost always rejected. The equal or almost equal split of the pie thus maximizes the payoff for the proposer (Camerer, 2003). Rejection of the "more than fair" offers constituting more than 50% of the pie is rare but consistently reported nonetheless (Güth, Schmidt and Sutter, 2003).

The Ultimatum game principle and context have been thoroughly covered by multiple authors in meta-analytical studies, for instance by Güth and Kocher (2014). The amount of on-topic data published so far is immense. The most important interpretation remains the same: the decision pattern obtained in behavioral experiments apparently contradicts the axiomatic concept of economic rationality, which is therefore unable to provide a valid explanation of individual behavior.

The value systems used in theoretical economics and game theory can be described as stable, linear and quantitative. More money is strictly preferred to less money, while a universal currency is used. The decision patterns in behavioral

experiments however imply individual perception and interpretation of the reward value. The responders reject a positive monetary value if the offer is considered unfair. Inequality aversion models have been elaborated, documenting and discussing the importance and perception of fairness in the Ultimatum game (Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000). Instead of using the nominal value of the payoff, players figure out an individual "net profit" or "utility" in a more complex way and expect the same from others. The proposers expect the rejection of an unfair offer and therefore they offer a fair share in order to maximize their utility. Playing Ultimatum game generally falls into the category of decision making under uncertainty, where the economic law of diminishing marginal utility and individual perception of the risk probabilities assume the difference between nominal value and individual expected utility. Yet the models of theoretical or normative economics cannot fully explain the decision patterns observed in behavioral experiments. The social dimension and perception of fairness in the game seem to play a major role in the interpretation of individual utility, as reported by many authors.

According to Forsythe et al. (1994), the proposers are often guided by own intrinsic fairness concerns. The responder knows how easy it was for the proposer to get the initial endowment and expects a fair share. This expectation changes and the offer and response rates differ if the players had to compete for the proposer role or earn the endowment (Franco-Watkins, Edwards and Acuff, 2013; Hoffman, McCabe and Smith, 1996; Gächter and Riedl, 2005). If a player can get an unfair share without the sacrifice on the side of the other player, the decision pattern will be guided by economic efficiency concerns rather than equality (Güth, Levati and Ploner, 2012; Bäker et al., 2010). In a market, the price of an item defines its nominal, objective value. The individual utility of the consumer is better reflected in the amount she would be willing to pay regardless of the market price, which principle applies even to situations where no market exists to establish an equilibrium price. Theoretically, the value of (un-)fairness and any components of individual utility other than the nominal value itself fall into the category of implicit costs, depending on whether we take or leave the option.

Many authors expected the Ultimatum game would tend to the theoretical Nash Equilibrium (minimal amounts offered and accepted) with higher stakes. This assumption sounds believable, as a small piece of a very big pie represents an absolute value harder for the responder to reject. The experimental data, however, do not support such an assumption, or at least not in the way originally expected. Raising the stakes surprisingly does not significantly change the frequency of the responses in standard setting (Slonim and Roth, 1998). According to Bechler, Green and Myerson (2015) raising the stakes and increasing the social

distance between the proposer and the responder leads to a lower share offered in bargaining over a virtual monetary reward. For obvious reasons, it is difficult to run the trials distributing very large amounts of money among the subjects. The difference in salience between a virtual reward and real money however represents a critical potential bias.

Andersen et al. (2011) ran their trial in poor villages in Northeast India. They modified the standard Ultimatum conditions by amending the instructions to Player 1 with additional information on how to play the game rationally, which modification increased the frequency of unfair offers significantly: 88% offers were less than 30% of the endowment, bargaining over a real monetary reward. The offer proportion declined with higher stakes, although the absolute amount of money actually rose as well. The unconditional rejection rates dropped at the same time. Such results are different from the experiments of Slonim and Roth (1998), who documented 7% of offers being 30% or less of the initial endowment, using the standard, unmodified instructions. Setting the experiment in very poor regions relatively increased the individual expected utility of the monetary rewards, but the amount of money any researcher can invest into the reward system remains limited. Cameron (1999) discussed how high the stakes need to be to complete the reversion to Nash equilibrium. However, even if we presumed the causality between higher stakes and lower shares, it would be correct to state more precisely that the subgame perfect equilibrium in a 1 billion game would still mean to propose and accept the smallest possible amount, i.e. 1 USD or less.

Theoretical economics and game theory imply that the “rational” choice represents the best (economically most effective) way to decide. The apparently irrational decision to refuse a positive value seems to be economically inefficient. Yet, we humans stubbornly produce the described pattern in decision making. It seems improbable from the evolutionary point of view that the current status of mankind would have resulted from a chain of economically ineffective decisions. The human social dimension supposedly contributes to the perception of the individual utility in a constructive way, as demonstrated for example in the altruistic punishment. In this protocol modification, an independent third player decides to punish the non-cooperative player, the “social parasite”, at the cost of lowering her own nominal payoff and without a chance to directly recover such a loss (Fehr and Gachter, 2002). The third player thus spends her own money in order to reduce the nominal payoff of the social parasite.

The works of Rand et al. (2013) in evolutionary game theory indicate that natural selection favors fairness. The different forms of unselfish behavior do not result in economically inefficient decisions, at least not at the low stake levels, as the purely selfish offers would be interpreted as unfair and therefore rejected.

Games using modified protocols, manipulating normative expectations, show agreement in the proposers` and responders` perception of fairness (Bicchieri and Chavez, 2010). Wang et al. (2015) demonstrate that individuals characterized by fairness and moderate kindness prevail over other individuals and the evolutionary advantage is gained by kindness. We can therefore assume that altruism, empathy and various social and affective manifestations do not necessarily deteriorate the decision making process, but rather make it more effective, indeed helping the Homo economicus to maximize her utility, at least at some stake levels.

1. Research Concept

Assuming there is a causal relation between the individual expected utility and the decision rates in the Ultimatum game, we looked for two reward systems with very similar instrumentation, deliverable by the same standard method, leading to different distribution of the decisions in a controlled experiment. Instead of controlling the monetary stake variable whilst inevitably keeping it at rather low levels, we decided to use a form of non-monetary reward, potentially bearing a defined, yet different individual utility. At the same time we wanted to avoid the potential bias of virtual reward and used real, salient rewards. Finally, we designed the trial protocol as blinded, randomized and providing anonymity to the participants.

Higher education features some evolutionary mechanisms, e.g. “survival” of courses and the necessity to gain the credits in order to continue the studies. The failure in meeting the criteria leads to “extinction” and the rate at which students fail exams is still called “mortality”. Each student has to pass multiple courses whilst the pass or fail decision is independent of any direct monetary value. Specifically, there is no market where the credits could be directly convertible to money. Economically, the individual value of a credit can be expressed using the concept of opportunity cost (“If I did a job for money, instead of studying for 20 hours, I would earn this much”). To successfully pass a mandatory course at the Faculty of Electrical Engineering of the Czech Technical University in Prague, each student has to accumulate a certain number of credit points. Grades A, B, C, D and E guarantee the pass, F means the failure. The best grade (A) equals 90 – 100 points, the difference between the grades is 10% and 49 points or less means failure. The credit points are assigned based on multiple various mandatory and optional activities, such as tests, essays, presentations, individual and team projects etc. Each student has a theoretical chance to accumulate more than 100 points. A single point or even a fraction of a point may result into passing

the course instead of failing or achieving a better grade. In our opinion, such a grading system represents a quantifiable behavioral model of survival and we assumed there is an individual marginal utility allocable to each credit, inconvertible to money.

2. Methodology

In the Ultimatum game we studied the response rates in experimental settings where the salient reward was represented by the usual, relatively low amount of money (100 CZK) against the rates in games played for the credit points (10 points). We modified the trial protocol to single blind on-line setting providing complete anonymity to the study subjects and detailed procedures keeping the decisions of the players completely private and confidential. Furthermore, we randomized the roles of the players and the order of the games.

2.1. Hypotheses

In our blinded randomized trial we tested the further *three hypotheses*:

H1: *The offer rates in the Ultimatum games for money and the offer rates in the games for credit points show different distribution.*

H2: *The average offer drops in the second Ultimatum games, compared to the first games.*

H3: *The average offer is higher in both the Ultimatum games for money compared to the games for credit points.*

We used the Mann Whitney U test to test H1 and analyzed the decision rates obtained in different experimental game settings to answer H2 and H3.

2.2. Study Subjects

The trial was conducted at the Czech Technical University in Prague (CTU), Faculty of Electrical Engineering. Approximately 100 students signed up for the research and 86 of them completed all required steps defined by the protocol. Each student received a random identification (ID) number in order to play the game anonymously and participated in two rounds of the game. In one round (first or second per random assignment), the endowment was represented by 100 Czech Crowns; in the other round of the game it was 10 credit points. There was a 7 day gap between the respective rounds. The proposer was instructed to split the endowment into two parts, dividable by 10 in case of money and made by full points in case of points (no fractions). The responder was instructed to either accept, or reject the proposal. Each subject was either the proposer, or the

responder in both rounds of the game, as assigned randomly before the first round. No subject was both the proposer and the responder during the experiment. Each subject participated in exactly one game for money and exactly one game for credit points; which of them was the first, had been assigned randomly. Using such a design, we studied the differences in the offer and response rates between the first and the second game and between the rewards of the two different kinds within the same population. Furthermore, we studied the pattern made in individual decisions, tracking each ID response anonymously. Objectively, 10 credit points represent the value difference between the respective course grades. The value of 100 Czech Crowns can buy approximately four 0.5 liter servings of the beer generally preferred by the students.

2.3. Experimental Procedure

The blinded randomized anonymous setting. All subjects participated in the game anonymously. They never knew who their counterpart/partner for the game was. The instructions only stated that was another human player. Neither the subjects, nor the researchers were able to assign a particular strategy to a particular player identity. There was no control or supervision over the decisions and the communication between the players happened through an e-mail, with no physical contact in any form. Nobody can directly or indirectly reward or punish the players for their smart, selfish, altruistic, or any other type of behavior, at any time, and the only reward winnable was represented by the in-game endowment. The protocol required simple tasks being performed by multiple independent researchers blinded to the subject identity and/or the study procedures. All subjects were asked to avoid alcohol and other psychotropic substances other than usual coffee or tea prior to the experiment and to keep their ID number strictly confidential. During the experiment, the subjects were instructed to never use any potentially identifying information other than the ID number. The researchers engaged in the experiment directly were positioned in the room such that they could not see the actual decision recorded by the study subjects. The subjects were instructed to make their decision silently, without commenting on or indicating their strategy. In the e-mail communication, the responder could see the ID number of the proposer and vice versa. An independent researcher, who has never been in contact with the study subjects, transferred the raw data obtained on-line as e-mail copies into a database for further interpretation and completed a list assigning the rewards to the applicable ID numbers. Another independent assistant, blind to the study purpose and procedures, delivered the monetary reward to the subjects based on the ID number. Yet another independent assistant added the reward credit points into the mix of “points assigned for

optional activities", therefore, in the end, not even the teacher assigning the final grade knew if any of these credit points have been acquired during the Ultimatum game or via any other graded activity. The authors of the study consider the strictly anonymous, blinded and randomized setting key elements in the study design, providing standard conditions allowing further long-term data collection and interpretation. Subjects playing their first game for money played the second round for credit points and vice versa. In each game, the proposer (Player 1) was assigned to the responder (Player 2) randomly, i.e. the coupling did not have any pattern other than that each player was either the proposer, or the responder in both rounds.

The on-line setting. There were two basic reasons why we decided to modify the classical pen and paper setting to on-line design. First, using on-line components provides an effective method for testing groups of subjects delivering the instructions under standard conditions. More importantly, it provides high level of anonymity. The communication between the proposer and the responder took place on a PC screen using standardized limited language providing the players with no other interpretable information than the offer and the response itself. Specifically, the only other information involved was the random ID numbers and the delay between the respective communication steps, in minutes. The proposer and the responder were located in different rooms, in different buildings and did not meet in person; they did not know each other`s identity.

For the communication itself, we used the services of a free local public e-mail provider. We created sufficient number of addresses for all proposers (P101@..., P102@…) and all corresponding responders (P201@..., P202@..., etc.). We used two university computer rooms located in different campus buildings. In the first computer room all proposers (i.e. Players 1) gathered; the second room was reserved for the responders (i.e. Players 2). Each subject used a dedicated computer to work individually. In the preparation phase, the researcher in the first room opened the e-mail web client, logged into each respective Player 1 address and created an empty message for each respective Player 2, copying in the independent researcher PX@... The computers in each room were physically located in such a way to provide privacy to each player, i.e. separated with enough space and / or a curtain. The anonymity among the players in each group however was not strictly required as it is obvious from the instructions they are not playing against each other, but against somebody else located completely elsewhere. Each group of players was randomly seated until the number of proposers matched the number of responders, which was verified by an independent communication link between the two leading researchers. It was important to have a P2 for every P1. Each group of subjects was moderated by a researcher, delivering the standard

instructions. These instructions contained the rules of the Ultimatum game itself and further information necessary for following the on-line method. The information was delivered step by step to the whole group. Every instruction step was standardized, no matter how trivial, to be delivered to each subject in the same way. The players were also given the opportunity to ask questions in case of doubt or uncertainty about the rules of the game or the course of actions. Such questions could be anticipated and the exact sequences from the original instructions were used wherever possible. Since there were rewards of two different kinds, we prepared two independent sets of instructions to avoid potential confusion during the instruction phase. In our experiment, the instructions were originally composed and delivered in Czech. An English translation sample could be found in the appendix (see Appendix for more information on the instructions).

2.4. Ethics

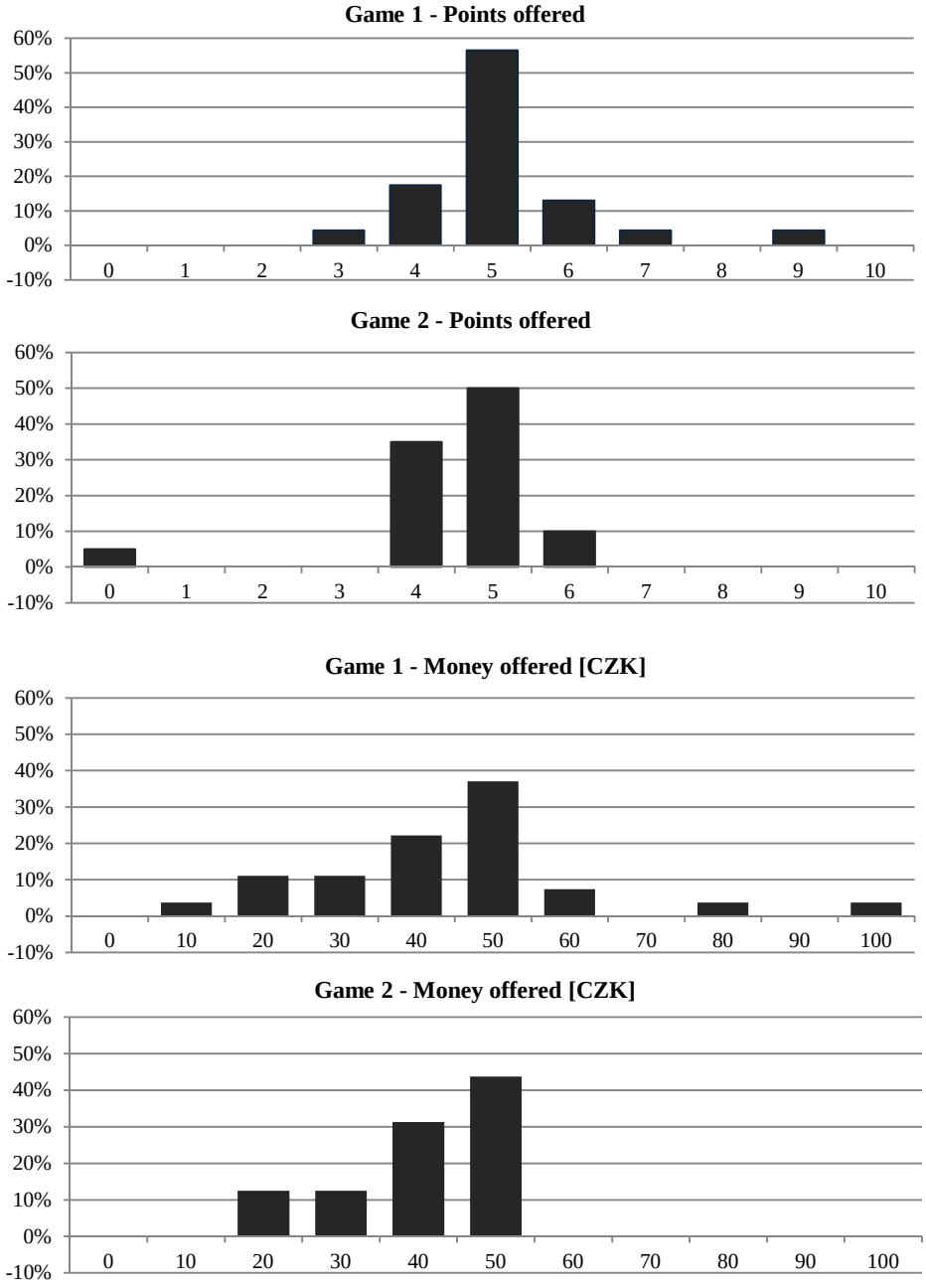
There is a limited opportunity to test human decision making in a standardized experimental setting, involving defined evolutionary or survival mechanisms, in an ethical way. In our design, students were rewarded for their voluntary participation in an experiment conducted at their university. The participation itself was not mandatory and each student could have got their grade employing other available optional and voluntary study activities providing the vital credit points. The participation represented furthermore an integral part of the educational process, as it helped students to understand the scientific method and experimental design. This educational concept rewarded students with credit points for extra work they did and extra knowledge and competence they developed. The setting was safe, the participation was consensual and each student could have quitted at any point. Each student had an equal opportunity to participate in the experiment and there was no limit set to the amount of participants.

3. Results

We obtained the results from four types of the game: two games played for money (first and second) and two games played for credit points (first and second). We expected the second game offers to be different (lower) from the first game in all respective cases, as the study subjects learned the specific situation, experienced the behavior of their counterparts in the first game and adjusted their strategies accordingly.

F i g u r e 1

Offer Distribution across All Games. The Figure Shows the Distribution of the Endowment Shares Offered to the Responder. Each Graph Represents a Different Game. The Initial Endowment was 10 Credit Points or 100 CZK



Source: Own data.

The offer distribution shown in Figure 1 is similar to the general pattern documented by other authors, as listed above. A maximum rate of the offers typically lies between 30% to 50% of the initial endowment. Offers of 20% and lower are rejected in 85.7% in all games. Offers of 40% and higher are accepted in 90.3% in all games. Very low and very high offers are generally present. Very high offers are, however, absent in the second games, which reflects the change in individual behavior. It is possible that at least some of the extreme offers account for misunderstanding and failure in following the instructions. However, it is impossible to prove without breaking the blinded condition and the anonymity of the subjects.

The average offer differs between all games, as shown in Table 1. The average offers drop in the second games and are higher in the games for credit points. Individual decision rates provided in Tables 2 and 3 reveal a different offer distribution as well.

T a b l e 1

Average Offers in All Games

The game	**%**
Game 1 Money offer [CZK]	44.4
Game 2 Money offer [CZK]	40.6
Game 1 Credit Points offer	51.3
Game 2 Credit Points offer	45.0
Games 1 + 2 Money offer [CZK]	43.0
Games 1 + 2 Credit Points offer	48.4

Notes: The table shows the average offers in% of the initial endowment.

Source: Own data.

T a b l e 2

Individual Decision Rates in Both Games for Money

Offer		**Accepted**		**Offer**	**Accepted (%)**	
CZK	Count	Yes	No	%	Yes	No
0	0	0	0			
10	1	0	1	2.3	0.0	100.0
20	5	1	4	11.6	20.0	80.0
30	5	3	2	11.6	60.0	40.0
40	11	7	4	25.6	63.6	36.4
50	17	17	0	39.5	100.0	0.0
60	2	1	1	4.7	50.0	50.0
70	0	0	0	0.0		
80	1	1	0	2.3	100.0	0.0
90	0	0	0	0.0		
100	1	1	0	2.3	100.0	0.0
Total	43	31	12	100.0		

Notes: The table shows individual offer rates and applicable responses.

Source: Own data.

T a b l e 3

Individual Decision Rates in Both Games for Credit Points

Offer		Accepted		Offer	Accepted	
Points	Count	Yes	No	%	Yes	No
0	1	0	1	2.3	0.0	100.0
1	0	0	0	0.0		
2	0	0	0	0.0		
3	1	1	0	2.3	100.0	0.0
4	11	10	1	25.6	90.9	9.1
5	23	22	1	53.5	95.7	4.3
6	5	5	0	11.6	100.0	0.0
7	1	1	0	2.3	100.0	0.0
8	0	0	0	0.0		
9	1	1	0	2.3	100.0	0.0
10	0	0	0	0.0		
Total	43	40	3	100.0		

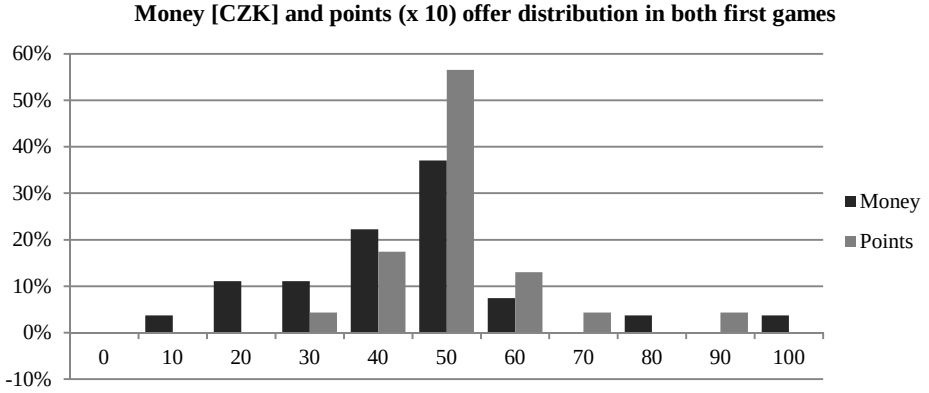
Notes: The table shows individual offer rates and applicable responses.

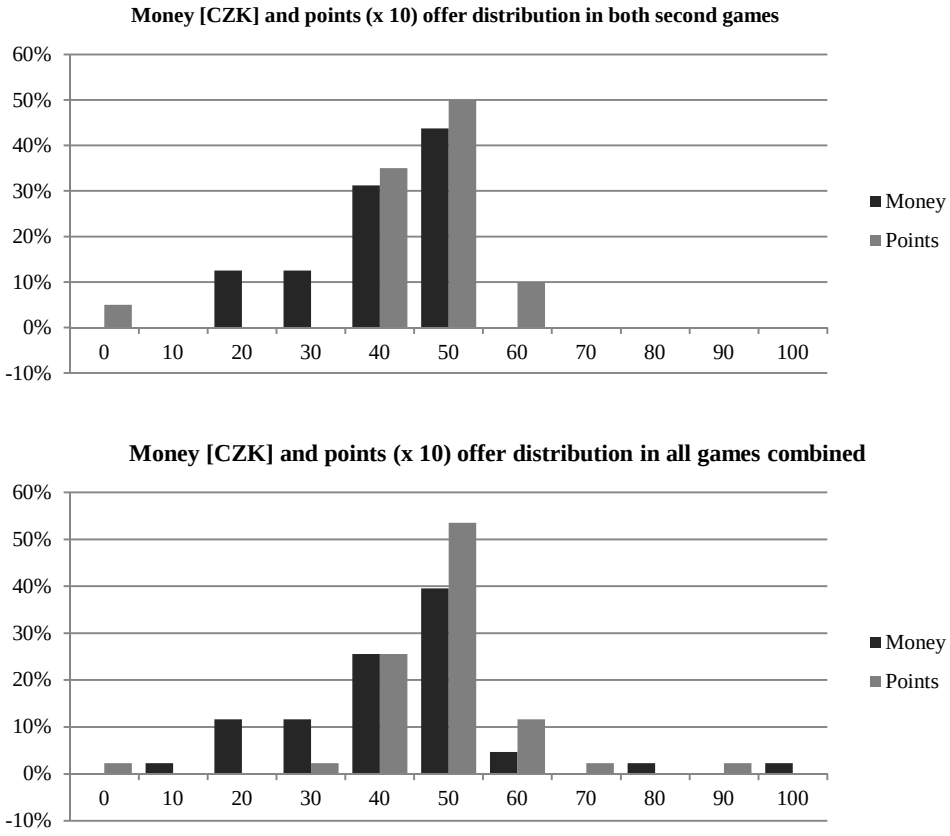
Source: Own data.

The games for credit points feature higher average offer and different distribution of the offers at the same time. Especially, the individual offers of 50 – 60% show higher rate in the games for points compared to the games for money, as shown in Figure 2. It is difficult to statistically analyze the response rates, because of its relatively low count at most offer levels. The typical (most frequent) 50% offers were accepted by 100% of responders in case of money and 95.7% of responders in case of credit points.

F i g u r e 2

Offer Distribution in Games for Money against the Games for Credit Points. The Figure Shows the Distribution of the Endowment Shares of Both Types to the Responder in All Games. The Offers Made in Credit Points are Multiplied by Ten to Fit the Same Percentile Ranks. The Initial Endowment was 10 Credit Points or 100 CZK





Source: Own data.

3.1. Testing the Hypotheses and Discussing the Outcomes

To answer the key hypothesis of the research (Hypothesis 1), we used the Mann Whitney U test. The nonparametric test of the null hypothesis that two populations are the same against an alternative hypothesis was used on the significance level 5% in order to compare the offer rates in the games for money and points. The Null Hypothesis (H0), stating that offers in both games follow the same distribution, was rejected. The distribution of the offers and decision making pattern thus differs in the games for money from the games for credit points.

Hypothesis 1: supported. Testing the non-monetary reward system against the classical monetary system in the same population indicates differences in the offer rate pattern. Individual decisions vary with the reward quality, which implies a different individual expected utility of the two mutually inconvertible rewards.

To answer the remaining two hypotheses, we analyzed and compared the offer rates observed in all four types of the game:

Hypothesis 2: supported. The average offer dropped in the second games for both money and credit points rewards, compared to the first games. This finding can be explained with the subjects learning the game mechanics, verging closer to the subgame perfect equilibrium, i.e. becoming more "rational" in the theoretical economic sense. The experience contributing to the cognitive processes involved in decision making represents a suitable explanation of this phenomenon.

Hypothesis 3: rejected. We expected the game for credit points leading to more economically "rational" offer distribution, closer to the Nash equilibrium. Administering a simple supportive survey we found out that the majority of students (84%) consider the 10 credit points stake individually "more valuable" or "significantly more valuable" than the 100 CZK stake. Thus, our expectation was in line with the assumption of higher stakes, represented here by supposedly higher individual value of the credit points, leading to lower shares offered. So far our expectations were consistent with the assumptions of other authors, especially Andersen et al. (2011), referenced above. Yet, the offer rates observed in credit point games can only be interpreted as more altruistic, more equitable, and therefore less rational in the normative economic sense. The higher rates of 60% and 70% offers in games for credit points, as recorded in Tables 2 and 3, indeed represent more than equitable P1 strategies.

The causality potentially underlying this finding should be discussed in a complex way. Although the findings of Andersen et al. (2011) are extremely valuable, their protocol modification inevitably verges to more rational decisions, which we interpret as a significant bias. The findings in games with virtual reward also support the idea of higher stakes leading to lower shares offered, but the virtual reward itself also represents a bias in any behavioral trial, as reported by Fantino et al. (2007). To call an experiment truly behavioral economic, one must use a real, salient reward.

In our opinion, the components of the decision making process contribute to the final decision in different accord depending on the individually perceived and interpreted value of the stake. For this purpose, we find it useful to distinguish between the purely irrational component (missing information, uncertainty about probabilities, cognitive inability of a brain to perform precise calculation, lack of attention etc.) and the intended non-rational component (altruism, pretended altruism, inequality aversion, social dimension). Both irrational and non-rational component deviate the decision from the strictly rational direction, but whilst the irrational represents a purely unintended error, which the decision maker would avoid if she could, the non-rational component is obviously "intended"

and a part of the human evolution, specifically of its social aspect. Instead of deteriorating the decision making process, the non-rational component helps the communication, helps the bargaining and in the Ultimatum game it prevents zero gains on the side of both players. Strictly said, we cannot prove if the construct non-rational component maximizes the expected utility of a player, but we can safely assume it prevents its minimization.

In our opinion, low amounts of money compared to very high amounts are not perceived just as different quantities on a linear axis, but an important quantitative difference induces conceptual discontinuity making the different nominal values individually perceived as different qualities. Whilst 100 CZK can buy us a few beers, very large amounts of money have the potential to change lives, i.e. represent an individual utility recognized by the decision maker as bearing the potential to significantly improve the quality of her life, to help her survival. It is reasonable to assume that we humans make the decisions that significantly change our lives in a different way, compared to the decisions with negligible marginal expected utility.

Furthermore, we find it useful to distinguish between pure economic rationality, which is final and defined by the economically most efficient payoff regardless of the way this decision has been made, from the cognitive rational thinking of the brain, which is by definition limited and causal – it fully depends on the brain functions, the available information and the economically effective results are never 100% assured (in fact they are quite rare in the real life). Of course P1 may rationally induce that a relatively low share in a 1 billion game represents higher marginal utility for P2 than an equitable share in a 100 CZK game. But at the same time, it is safe to assume that P1 is afraid to risk her own marginal expected utility in the 1 billion games for exactly the same reason. A clever and experienced decision maker will not play the game rationally, because strictly rational play would indeed minimize her payoff, instead of maximizing it. A clever and experienced decision maker will offer an equitable share.

The value of the credits in our experimental model is closer to the "survival" value, compared to the 100 CZK. The differences in the decision rates between the non-monetary reward system and the low-stake monetary reward therefore constitute the most important findings. The instrumental similarity and simplicity of both rewards puts up to intuitive comparison, they appear very similar, yet potentially lead to different employment of the rational, non-rational and irrational components of the decision making process. It would probably be more accurate to compare two monetary rewards, one low stake and one very high stake against each other. Specifically, this would allow construction of a quantitative model. According to our findings, based on simple subject interviews,

there is an individually perceived but imprecisely defined threshold between "too low" and "survival" values. A typical answer to the question: "How much money would significantly change your life for better?" was: "A million CZK" (approximately 40,000 USD using just the exchange rate without any corrections), usually immediately spontaneously corrected to "… or rather ten million" respectively "… or rather a hundred million". In any case, we are not able to design behavioral experiments spending so much money on rewards. Testing the stake of 100 CZK against e.g. 200 CZK is something we find less than useful, because from the point of view of our theory both stakes are too low.

The falsification of H3 was surprising for the authors of this study. We find it theoretically possible, that the unexpected result was partially caused by the meticulous protocol design and experimental method. It is very demanding to design a behavioral trial as blinded, randomized and strictly anonymous and most trials are not that rigorous. It is possible that the strict anonymity and private feeling of the subjects contributed to the free perception and interpretation of the reward quality value. From this point of view we consider our protocol rather unique and compare our results to results obtained via other protocols and protocol modifications with caution.

Conclusion

We consider our protocol effective to test the rewards of different quality against each other. The method provides standard conditions for reliable, long-term data collection. Rigorous conduct, multiple personnel independently performing partial tasks and a sufficient number of compliant study subjects are the necessary requirements that can be met at universities, together with the alternative, non-monetary reward system bearing individual utility in the form of credit points. During the experiment we observed an excellent level of cooperation. Low discipline, mainly loud comments from the subjects, would have provided framing and other biasing effects and must have been prevented. The group size of 15 study subjects or less per researcher is recommended in order to deliver the instructions effectively.

Although purely on-line protocols potentially promise very high efficiency, we find the moderating role of the researcher necessary to assure the standard conditions. All possible situational and context elements may represent significant bias to the decision making process, including the timing of the decision, i.e. potential delay or time pressure (Cappelletti, Güth and Ploner, 2011; Grimm and Mengel, 2011), and should be standardized by the researcher as much as possible.

Other non-monetary value systems have been tested in the Ultimatum games, e.g. bargaining over the waiting time (Berger et al., 2012), attempting to prevent the windfall gains effect. Our aim was to use a reward of non-monetary quality that could be directly tested against the standard monetary reward, using the same instruments and methodology, including the original condition of the windfall gains. Essentially, we wanted an alternative reward system that would be as similar as possible to the low stake monetary reward. At the same time, the credit point system is not directly convertible to money and the only economic tool available to compare the values of the different qualities is the principle of opportunity cost.

Empirically, shadow economy emerges if there is no chance to trade legally. The authors of this paper are not aware of any such case of teachers selling credit points for money in CTU. Theoretically, if such a black market existed, the value of 10 credit points would most probably significantly exceed 100 CZK. Revealing the existence of a market of this kind would indeed falsify our initial concept of different reward quality contributing to the different individual perception of the reward value. It would demonstrate direct convertibility between the two reward systems and turn our trial into a game with different nominal stakes. The authors of this paper, however, consider such situation extremely unlikely. Interestingly, with further understanding of the decision making causality in this particular case, running an experiment like this could reveal the existence of an illegal market.

As to every study, our study shows limitations, despite the careful design. From the demographic perspective an obvious limitation is the subject population. The study was performed on students of the Czech Technical University in Prague suggesting an above-average cognitive ability and uneven gender distribution, with majority of the students being smart young men. However, when using aside from money credit points as a second commodity, no better population could have been chosen, as credit points would not serve the reward purpose. With these limitations in mind, it is important to mention that we were able to test and re-test the same population and study different perception of the reward value on individual level.

Our main hypothesis stating that the offer rates in the Ultimatum games for money and the offer rates in the games for credit points show different distribution was supported, using the Mann Whitney U test. According to our interpretation, this is due to different reward qualities, not mutually convertible in an existing market, leading to different individual perception of the reward value and inducing different interplay of the rational, non-rational and irrational components of the decision making process.

Despite the vast amount of work published on the topic, there was no general agreement whether at all or how exactly the offer and response rates in the Ultimatum game vary with the monetary value of the stakes. We demonstrate the reward leading to different offer and/or response rates without the necessity to invest unrealistic amounts of money into the reward system.

References

ANDERSEN, S. – ERTAC, S. – GNEEZY, U. – HOFFMAN, M. – LIST, J. A. (2011): Stakes Mater in Ultimatum Games. American Economic Review, *101*, December, pp. 3427 – 3439.

BÄKER, A. – GÜTH, W. – PULL, K. – STADLER, M. (2010): Does Entitlement Crowd Out Efficiency or Equality Seeking? Selling the Roles in Generosity Game Experiments. Jena Economic Research Papers, *4*, No. 2010 – 091, pp. 2 – 18.

BECHLER, C. – GREEN, L. – MYERSON, J. (2015): Proportion Offered in the Dictator and Ultimatum Games Decreases with Amount and Social Distance. Behavioural Processes, *115*, June, pp. 149 – 155.

BELL, D. – RAIFFA, H. – TVERSKY, A. (1988): Decision Making: Descriptive, Normative, and Prescriptive Interactions. Cambridge: Cambridge University Press. ISBN 0521368510.

BERGER, R. – RAUHUT, H. – PRADE, S. – HELBING, D. (2012): Bargaining over Waiting Time in Ultimatum Game Experiments. Social Science Research, *41*, No. 2, pp. 372 – 379.

BICCHIERI, C. – CHAVEZ, A. (2010): Behaving as Expected: Public Information and Fairness Norms. Journal of Behavioral Decision Making, *23*, No. 2, pp. 161 – 178.

BOLTON, G. – OCKENFELS, A. (2000): ERC: A Theory of Equity, Reciprocity, and Competition. American Economic Review, *90*, No. 1, pp. 166 – 93.

CAMERER, C. (2003): Behavioral Game Theory: Experiments in Strategic Interaction. Princeton, NJ: Princeton University Press. ISBN 9780691090399.

CAMERON, L. A. (1999): Raising the Stakes in the Ultimatum Game: Experimental Evidence from Indonesia. Economic Inquiry, *37*, No. 1, pp. 47 – 59.

CAPPELLETTI, D. – GÜTH, W. – PLONER, M. (2011): Being of Two Minds: Ultimatum Offers under Cognitive Restraint. Journal of Economic Psychology, *32*, No. 6, pp. 940 – 950.

FANTINO, E. – GAITAN, S. – KENNELLY, A. – STOLARZ–FANTINO, S. (2007): How Reinforcer Type Affects Choice in Economic Games. Behavioural Processes, *75*, No. 2, pp. 107 – 114.

FEHR, E. – SCHMIDT, K. (1999): A Theory of Fairness, Competition and Cooperation. Quarterly Journal of Economics, *114*, No. 3, pp. 817 – 851.

FEHR, E. – GACHTER, S. (2002): Altruistic Punishment in Humans. Nature, *415*, No. 6868, pp. 137 – 140.

FORSYTHE, R. – HOROWITZ, J. L. – SAVIN, NO. E. – SEFTON, M. (1994): Fairness in Simple Bargaining Experiments. Games and Economic Behavior, *6*, No. 3, pp. 347 – 369.

FRANCO-WATKINS, A. M. – EDWARDS, B. D. – ACUFF, R. E. (2013): Effort and Fairness in Bargaining Games. Journal of Behavioral Decision Making, *26*, No. 1, pp. 79 – 90.

GÄCHTER, S. – RIEDL, A. (2005): Moral Property Rights in Bargaining with Infeasible Claims. Management Science, *51*, No. 2, pp. 249 – 263.

GRIMM, V. – MENGEL, F. (2011): Let Me Sleep on It: Delay Reduces Rejection Rates in Ultimatum Games. Economics Letters, *111*, No. 2, pp. 113 – 115.

GÜTH, W. – SCHMITTBERGER, R. – SCHWARZE, B. (1982): An Experimental Analysis of Ultimatum Bargaining. Journal of Economic Behavior and Organization, *3*, No. 4, pp. 367 – 388.

GÜTH, W. – SCHMIDT, C. – SUTTER, M. (2003): Fairness in the Mail and Opportunism in the Internet: A Newspaper Experiment on Ultimatum Bargaining. German Economic Revue, *4*, No. 2, pp. 243 – 265.
GÜTH, W. – LEVATI, V. – PLONER, M. (2012): An Experimental Study of the Generosity Game. Theory and Decision, *72*, No. 1, pp. 51 – 63.
GÜTH, W. – KOCHER, M. (2014): More than Thirty Years of Ultimatum Bargaining Experiments: Motives, Variations, and a Survey of the Recent Literature. Journal of Economic Behavior and Organization, *108*, Issue C, pp. 396 – 409.
HOFFMAN, E. – McCABE, K. – SMITH, V. (1996): On Expectations and the Monetary Stakes in Ultimatum Games. International Journal of Game Theory, *25*, No. 3, pp. 289 – 302.
OOSTERBEEK, H. – SLOOF, R. – van de KUILEN, G. (2004): Cultural Differences in Ultimatum Game Experiments: Evidence from a Meta-analysis. Experimental Economics, *7*, No. 2, pp. 171 – 188.
RAND, D. G. – TARNITA, C. E. – OHTSUKI, H. – NOWAK, M. A. (2013): Evolution of Fairness in the One-shot Anonymous Ultimatum Game. Proceedings of the National Academy of Science, *110*, No. 7, pp. 2581 – 2586.
SLONIM, R. – ROTH, A. E. (1998): Learning in High Stakes Ultimatum Games: An Experiment in the Slovak Republic. Econometrica, *66*, No. 3, pp. 569 – 596.
WANG, L. – YE, S. – JONES, M. – YE, Y. – WANG, M. – XIE, No. (2015): The Evolutionary Analysis of the Ultimatum Game Based on the Net-profit Decision. Physica A, *430*, July, pp. 32 – 38.

Appendix

Instructions for the Proposers (translated from Czech)

- *Welcome, everybody. Use the computer, please. You will work individually.*
- *Do not press any key, yet. Strictly follow my instructions, please; I will explain what to do.*
- *Our experiment has a form of a game. Everybody plays the game individually. It is important to remain silent since this moment. Raise your hand if you have any question.*
- *Now, I am endowing each of you with 10 credit points. Split this endowment into two parts, please. Keep one part for yourself. You will offer the other part to an unknown player via e-mail. The other player is awaiting your offer right now. The other player may accept, or refuse your offer. If the other player accepts, each of you two players will receive the dedicated share, exactly in the way you divided the endowment. The credit points will be added to your course account for real. If the other player rejects your offer, both of you two players will receive zero points for this experiment, none of you will get anything.*
- *How many points you will really get thus depends both on your decision and the decision of the other player.*
- *The other player is a human, randomly paired with you, who does not know you and you do not know them. The game is perfectly anonymous. Your confidentiality is fully assured. Not even we, the researches, will know how you played. This particular game is played for the first and the last time, the opportunity will not happen again. The credit points will be added to your course account by an independent assistant who does not know you. Your teachers will not know whether or how you played the game.*
- *Do you have any questions?*
- *Now, I will explain how to complete the offer via e-mail. Do exactly what I say. Do not speak, please.*
- *Enter your ID code into the **subject** field.*

• *Enter **"I offer you"** into the text field and specify how many credit points you propose to offer to the other player. Offer only full points, no fractions. Do not write any other text.*

• *Consider your offer for a while. The other player may accept, or reject your offer.*

• *Have you made an offer? Then, send the email clicking the **send** button in the upper left.*

• *Now we will wait for the answer. Click the **refresh** button in the upper left to check the incoming messages.*

• *Open the new message. Do not speak, please. Now you know the answer. Keep it confidential.*

• *Erase the message by clicking **erase** and confirm the operation.*

• *Help us keep the experiment strictly anonymous and do not tell anyone how you played and do not discuss the details of your strategy, please.*

• *Thank you.*

Instructions for the Responders (translated from Czech)

• *Welcome, everybody. Use the computer, please. You will work individually.*

• *Do not press any key, yet. Strictly follow my instructions, please; I will explain what to do.*

• *Our experiment has a form of a game. Everybody plays the game individually. It is important to remain silent since this moment. Raise your hand if you have any question.*

• *It is your task to decide, whether you accept or reject an offer. Another player has just been endowed with 10 credit points. He / she will split this endowment into two parts. He / she will keep one part and offer the other part to you via e-mail. If you accept the proposed offer, each of you two players will get the dedicated number of points exactly in the way the other player divided the endowment. These credit points will be added to your course accounts for real. If you reject the offer, both of you two players will receive zero points for this experiment; none of you will get anything.*

• *The other player is a human, randomly paired with you, who does not know you and you do not know them. The game is perfectly anonymous. Your confidentiality is fully assured. Not even we, the researches, will know how you played. This particular game is played for the first and the last time, the opportunity will not happen again. The credit points will be added to your course account by an independent assistant, who does not know you. Your teachers will not know whether or how you played the game.*

• *Do you have any questions?*

• *Now I will explain how to answer the offer via e-mail. Do exactly what I say. Do not speak, please.*

• *Click the **new messages** button to check if there is an incoming message.*

• *Open the new message. Do not speak, please. Now you know the proposed offer.*

• *Click the **answer to all** buttons.*

• *Into the text field, enter "I accept" if you accept the offer, or "I reject" if you reject the offer. Consider your answer for a while. If you accept, each of you will get the dedicated share. If you reject, nobody will get anything.*

• *Also enter your ID code into the text field of the e-mail. Do not write any other text.*

• *Press the **send** button.*

• *If the message was sent successfully, you should be back in the menu of incoming messages. Check the last message and delete it clicking the **delete** button.*

• *Help us keep the experiment strictly anonymous and do not tell anyone how you played and do not discuss the details of your strategy, please.*

• *Thank you.*