# Fair ultimatum: an experimental study of the Myerson value*

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**Abstract**

We conduct a laboratory experiment to test the empirical behavior of the bid-and-propose mechanism, defined in Navarro and Perea (2005). This mechanism implements the Myerson value for networks, and therefore its outcome posesses fairness properties. Since the bid-and-propose mechanism includes an ultimatum game in the last stage, we design an experiment with several treatments, where subjects also play the simple ultimatum game. In order to check whether subjects behave fairly in the sense of Myerson or they are inequity averse, we compare results from games with symmetric and asymmetric outside options.

Keywords: experiments, fairness, Myerson value, ultimatum game

JEL Classification Numbers: C72; C91; D63

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# 1 Introduction

The problem of allocating a certain amount of money across players is still a source of challenging research. The value to be distributed can be thought of as the value of a joint production, joint bargaining or any type of joint effort by the group of players that can depend on a hierarchy, a network structure, or any other type of internal organization. We present here a series of experimental treatments testing the way two individuals bargain about how to distribute an amount of money available only in case of an agreement. These treatments are based on a well known bargaining procedure called the ultimatum game.

In the ultimatum game, two players have to agree on how to divide a pie of a given size. One of them, called the proposer, suggests a division, and the other, the chooser, has to accept or reject. If the chooser accepts, the division is implemented. If he rejects, they both get zero. Non-cooperative game theorists and economists assume that players acting non-cooperatively will always look for the maximization of their own payoffs. The (subgame perfect Nash) equilibrium of the ultimatum game consists of the proposer proposing zero (or the smallest amount permitted in the game) to the other player and the chooser accepting. In most experiments on the ultimatum game (see, among others, the review in Bearden (2001)) such an equilibrium is almost never observed. The ultimatum game thus clearly illustrates the conflict of the theoretical assumption of pure selfish behavior of players with empirical findings on players' behavior driven by motivations as fairness, reciprocity or pure altruism. This work contributes to this debate by testing the nature of fairness considerations by individuals in the context of value division.

Fairness, as an axiom or property, has been formally defined for different contexts of payoff division. In general, it aims at reflecting some idea of justice or equity. In the context of distributing the value of a network among its participants, a division rule is called fair (Myerson (1977)) if any pair of agents directly connected lose or gain the same amount of payoff from breaking their connection in the network. Each direct connection (or link) in the network can be then interpreted as a pair of players who cooperate and bargain over the gains from creating such bilateral relationship. As such, the axiom of fairness implies an equal-gains principle, equal bargaining power or a sort of altruistic behavior. The so-called Myerson value is the unique division rule (see Myerson (1977), Feldman (1996), Jackson and Wolinsky (1996) and Navarro (2007)) satisfying fairness and distributing the total value of a connected network among its participants.

In the experimental literature testing the accuracy of the subgame perfect equilibrium as a prediction of behavior in the ultimatum game, it seems that subjects that are in the position of the chooser reject offers they consider unfair or unacceptable. Therefore proposers are believed to offer more even distributions either because they are afraid to be rejected or because they feel their power is not legitimate, as being the proposer or the chooser is decided randomly. This last argument could also be consistent with the fact that people spend unearned money in a different way that earned money. In line with this last idea some experiments have been conducted. Players behave more according to the theory, i.e., less fair, when they have earned their position (see again Bearden (2001)).

We test a game form where the proposer earns his position and the theoretical (subgame perfect equilibrium) prediction is fair in the sense of Myerson explained above. The theoretical bargaining procedure that we call the bid-and-propose game is based on Navarro and Perea (2005) and develops in two stages as follows:

- Stage 1. Players bid simultaneously for becoming the proposer by submitting a non-negative number. The player with the highest bid becomes the proposer in the next stage. Ties are broken with a random device.

- Stage 2. The proposer sends a monetary offer to the chooser. If the latter accepts, the proposed split is implemented as in the ultimatum game. If the chooser rejects, they both get zero, moreover the proposer must pay his first-stage winning bid to the chooser.

We test not only the effect of the bidding taking place at the beginning of the game, but also the effect of the asymmetric outside options on the distributions that are offered, as, in the context of Myerson, fairness says that two players bargaining directly should marginally (with respect to outside options) gain the same. This means that a player with a higher outside option should get more than half of the pie. In order to do that, we conduct a laboratory experiment with six treatments:

- **Treatment 1. The ultimatum game with zero outside options**

  Two players must divide an amount of money $\pi$. One of them, who is randomly appointed to be the proposer, sends an offer, $o$, suggesting a division $(\pi - o, o)$ in which he receives $\pi - o$ and the other player receives $o$ monetary units. This other player, called the chooser, can either accept or reject the proposal. If he accepts, the amount of money $\pi$ is split according to the proposal, while if he rejects, neither player receives anything.

- **Treatments 2 and 3. The ultimatum game with asymmetric outside options**

  In these treatments the rules of the ultimatum game presented in treatment 1 apply with the only difference that if the chooser rejects the offer, players receive their stand-alone values. In this case one player earns $v_1$ and the other earns $v_2$ monetary units. In treatment 2, $v_1 > v_2$, while in treatment 3 the opposite inequality holds.

- **Treatment 4. The bid-and-propose game with zero outside options**

  This game consists of two stages. In stage 1 players bid to become the proposer in stage 2. This is done by simultaneously choosing a non-negative number. The player who has chosen the highest number becomes the proposer. In stage 2 a modified version of the ultimatum game is played since the proposer must pay his winning bid to the chooser.

- **Treatments 5 and 6. The bid-and-propose game with asymmetric outside options**

  In these treatments the rules of the bid-and-propose game presented in treatment 4 apply, but players earn asymmetric stand-alone values if a rejection happens. That is, in stage 2 players receive their stand-alone values and the proposer must pay his winning bid to the chooser.

Our main conclusion is that both outside options have the expected effect. The higher the outside option for a player, the higher the share of the pie. The effect of the bidding stage on the final share of the pie is partially in line with theory. First, players do not bid the same quantity, as subgame perfection predicts, but do so depending on the value of the outside options. Second, data is consistent with the idea that proposers exploit more their position when they feel they have gained their position. Third, according to the theory, choosers have more bargaining power (than in the ultimatum game) as they can always reject and obtain the bid by the proposer. Consistent with that, choosers do reject more often for the low offers in the bid and propose mechanism. On average, choosers are worse off in the bid-and-propose mechanism, either because exploitation from proposers is stronger in the bid-and-propose mechanism, or due to the higher rate of rejections.

This paper is organized as follows. The next section summarizes the theoretical properties of the bid-and-propose mechanism. Section 3 explains our experimental design, while section 4 presents the observed data and our main findings. Section 5 concludes.

## 2 Theoretical Results

In what follows we shall compare our experimental results with the theoretical predictions, i.e. with the subgame perfect Nash equilibrium to be found with backward induction. For future reference table 1 summarizes the game theoretical results. In the ultimatum game the chooser accepts any amount that is larger or equal than her stand-alone value. Knowing this, the proposer should offer the smallest acceptable amount to her, i.e. $v_{CH}$. Therefore the equilibrium outcome is $(\pi - v_{CH}; v_{CH})$, where the first element is the proposer's payoff while the second one is the chooser's. In treatment 1 it is $(10; 0)$, while in treatments 2 and 3 it is either $(10; 0)$ or $(5; 5)$, depending on whether the player with the higher stand-alone value is lucky or not when roles are assigned by nature. As for the bid-and-propose game, Navarro and Perea (2005) show that player's bids in the first stage should coincide and be equal to $\frac{1}{2}(\pi - s)$, where $s$ is the sum of the two players' stand-alone value. In the second stage the chooser should accept any offer that is higher or equal to her stand-alone value plus the proposer's bid, since the latter would be paid to her in case of rejection. Hence, the equilibrium payoff is $(\pi - v_{CH} - b_P; v_{CH} + b_P)$. This is in fact the Myerson value, as $b_P = \frac{1}{2}(\pi - v_P - v_{CH})$, with $v_P$ being the stand-alone value for the proposer. In treatment 4 it is equal to $(5; 5)$, with both players choosing a bid of 5, while in treatments 5 and 6 it is either $(7.5; 2.5)$ or $(2.5; 7.5)$ depending on the stand-alone value of the proposer (or the chooser), with both players choosing a bid of 2.5.

## 3 Experimental design

We recruited 22 subjects to a computer lab through announcements posted across the campus of the Universidad de Navarra in Pamplona, Spain. They were informed that they would participate in a paid experiment on decision making. The experiment was programmed and conducted with the software z-Tree (Fischbacher, 2007). The session took place in May, 2007. We implemented two games in six treatments. At the beginning of each treatment, printed instructions were given to subjects and were read aloud to the entire room. Instructions explained all rules to determine the resulting payoff for each participant. They were written in Spanish and contained some numerical examples to illustrate how the program works. The English translation of the instructions can be found in the appendix.

At the start of each round the computer randomly assigned subjects to groups of two. We applied stranger treatment where participants were not informed about who the other member of their group was. Also, a new assignment was made in every period; hence participants knew that groups were typically different from period to period. Subjects were not allowed to communicate among themselves; the only information given to them in this respect was the size of the group.

In the first three treatments the ultimatum game was implemented in order to divide 10 monetary units (EMU) between two people in each round, while in the last two treatments subjects bargained over 10 monetary units according to the rules of the bid-and-propose game. We decided to sequence treatments in this way because we found it easier to explain the two-stage bid-and-propose mechanism (to untrained subjects) after the ultimatum game.

Treatments, with some exceptions, consisted in one practice and 5 paying rounds. Table 2 offers a brief summary of our treatments for later reference. We allowed for two digits in all numerical choices in order to make the decision problem similar to a problem of dividing real money (Euros) between two people.

In the first three treatments subjects were asked to split 10 monetary units in each round according to the rules of the ultimatum game. The roles of the chooser and the proposer were assigned in a random way using equal probabilities by the computer. In treatment 1 subjects received 0 monetary units in case of a rejection, while in treatments 2 and 3 one player in each group received 0 and the other 5 monetary units. We shall refer to these games as asymmetric games due to the asymmetry in the stand-alone values. In treatment 2 the first 11 subjects' stand-alone value was equal to 0 and the second 11 subject's received 5. In treatment 3 we implemented the reversed asymmetric case.

In the last three treatments subjects played a symmetric and two asymmetric versions of the bid-and-propose game. Asymmetries arose in the stand-alone values, and each subject played one treatment (5 rounds) having a stand-alone value of 0 and a treatment having a stand-alone value of 5 monetary units.

For convenience, and in order to keep subjects informed on their performance, the history of personal earnings appeared after each repetition on screen during the whole experiment. All computer screens contained payoff simulation tables on the lower part. In this way, before making their final decisions, subjects could simulate their payoffs (both their own payoff and the other player's payoff) in several hypothetical situations. In these tables subjects could write the opponent's strategic choices and their own ones. Afterwards, by a simple mouse click they obtained information on the final results given the specified actions.

The session lasted an hour and a half. At the end, participants were paid individually and privately. Final profits were computed according to a simple conversion rule, 100 experimental monetary units equal EUR 8.5, based on the personal gains in experimental monetary units during the whole session. Subjects also received a fixed amount of EUR 3 as show-up fee. Taking into account the six treatments, individual net payments (payments without the show-up fee) ranged from EUR 8.13 to EUR 14.95, with a mean of EUR 11.73 and a standard deviation of EUR 1.75.

# 4 Experimental results

In this section we present the statistical analysis of the data that we collected in the experimental lab. The first two subsections consider the global characteristics of the mechanisms, such as efficiency and fairness. The third one offers insight into the empirical individual decision making process. When talking about differences we refer to the results of both the parametric $t$-tests and the non-parametric Kruskal-Wallis tests. In case it is not stated otherwise the reported differences are significant at the usual significance levels according to both tests.

## 4.1 Efficiency

Independently on personal payoffs, the resulting outcome for both games considered here is efficient whenever the proposer manages to offer a split of the pie that the chooser decides to accept in the last stage. Hence, Pareto efficiency in our treatments is represented by the last-stage acceptance rate. We also compute an efficiency measure called "realized efficiency" that compares the sum of final payoffs with the size of the pie being the largest amount that can be shared by the players.[1]. Table 3 reports the efficiency results. Due to a smaller rejection rate, the ultimatum game proved to be efficient in a larger proportion of cases than the bid-and-propose game in the symmetric treatment. Also its realized efficiency measure is significantly higher than the one computed for the alternative mechanism. It is interesting though that we can not prepare a clear efficiency ranking in the asymmetric case, as the observed differences show both positive and negative signs that are not significant except for one repetition-to-repetition comparison.

## 4.2 Fairness

The goal of the ultimatum game and the bid-and-propose game is to divide a certain monetary amount between two players. In this subsection we study final payoffs, in particular we compare them to the theoretical predictions. The rules of the ultimatum game assign all the bargaining power to the proposer, hence the subgame perfect Nash

[1]This efficiency measure frequently appears as "efficiency index" in the literature.

equilibrium outcome cannot be considered fair in general. In particular, in the symmetric case implemented in treatment 1 and the asymmetric situations where the chooser's stand-alone value is zero, it predicts an extreme split of the pie according to which the proposer keeps practically the whole pie and the chooser has to walk away without anything (or with a negligible amount). In our treatments the only exception to this is the asymmetric situation in which the chooser's stand-alone value is 5, since the solution in that case is an equal split of the pie. The bid-and-propose game implements a fair split of the pie that is known as the Myerson value in cooperative game theory. In the symmetric case, when players' stand-alone values are equal as in treatment 1, the subgame perfect Nash equilibrium predicts equal shares. In the asymmetric cases, the Myerson value imposes the same difference between the final payoffs as the existing difference between the stand-alone values. In treatments 5 and 6 this implies an equilibrium outcome of $(2.5; 7.5)$ or $(7.5; 2.5)$ depending whether the first or the second player has a stand-alone value of 5 instead of 0.

Experimental evidence shows that people tend to deviate from the subgame perfect Nash equilibrium in the ultimatum game and the pie is usually split such that the proposer gets 60% and the chooser 40%.[2] This outcome can be sustained as a Nash equilibrium (see Gale, Binmore and Samuelson (1995)) and there also exists a vast literature that rationalize its supporting strategies. Gale, Binmore and Samuelson (1995) show that trial-and-error learning can lead the ultimatum repeated game framework to Nash equilibria that are not the subgame perfect. They point out that the puzzle in the experiments comes from the choice of subgame perfection as the rationality concept for subjects, as in any Nash equilibrium selfishness is present. More utilitarian approaches can be found, among others, in Rabin (1993), Levine (1998), Fehr and Schmidt (1999) or Bolton and Ockenfels (2000), where subjects' utility functions reflect preferences for altruism (they like being good to others), reciprocity (they like being good to good people and mean to mean people) or justice (they like being treated fairly). Feelings of reciprocity or justice incorporated in the responders utility function suffice for payoff-maximizing proposers to make positive offers, as proposers want to make an acceptable offer to the responder.

[2]We refer to Oosterbeek et al. (2004) who present a meta-analysis of utlimatum game experiments.

Our data with results summarized in tables 5 and 6 confirm this, since the proposer's payoff in treatment 1 is equal to 4.37 in expected terms and to 5.59 if we only consider the accepted ones. The chooser's is significantly smaller being 3.45 across the whole treatment[3], and 4.41 if only accepted proposals are considered. Asymmetry in the stand-alone values has an important effect on behavior. Final payoffs tend to be less balanced, but do not reach the extremes predicted by the subgame perfect equilibrium. A proposer with 0 stand-alone value expects 2.83 (a chooser 5.73) while with a value of 5 this result is 5.98 (for a chooser 3.53). When considering accepted offers only, these numbers are 3.97 and 6.09. In this case choosers get what is left from the pie.

The bid-and-propose game slightly modified the patterns observed in the ultimatum game treatments. Payoffs moved in the expected direction, nevertheless they did not reach the equilibrium level. Part B in tables 5 and 6 show that proposers earn significantly less 2.54 and choosers get practically the same 3.46 in treatment 4 as compared to treatment 1[4]. When looking at the efficient results only these numbers are 5.94 and 4.06, and they increase with the stand-alone value.[5]

## 4.3 Individual behavior

In what follows we report empirical results as for bidding, proposals and acceptance decisions.

Tables 8 and 10 show that subjects tend to bid low in the bidding stage of the bid-and-propose mechanism. The numbers we recorded are significantly smaller than the equilibrium bids, however the difference between bids in treatment 4 and treatments 5-6 shows the expected sign. There is a significant[6] difference between the symmetric and the asymmetric treatments and also stand-alone values seem to influence bids in a positive

[3]Although the p-value for this comparison with the parametric $t$-test is of 7%

[4]The p-value here for the comparison between proposer and chooser is of 3% for the parametric test and 6% for the non-parametric

[5]We tested the observed differences in payoffs between the two mechanisms both parametrically and non-parametrically. It turns out that the number reported in the mean rows of tables 5 and 6 are significantly different when considering all the offers or the ones made by a proposer with 0 stand-alone value in the symmetric case. If we look at the accepted offers, the payoff difference in the symmetric treatments loses significance.

[6]For all usual significance level both according to the parametric $t$-test and the non-parametric Kruskal-Wallis test.

way in the latter case. In the bid-and-propose mechanism the proposer enjoys more bargaining power than the chooser. Nevertheless bidding in the auction stage reduces the proposer's bargaining power as the winning bid increases the chooser‘s stand alone value. It seems that our subjects undervalued the proposer‘s power and bid less than expected. The difference explained by the stand-alone values is significant and is also confirmed by the regression analysis in the first column of table 10.[7] The goodness of fit of the regressions in the same table proves that bids tend to depend on the sum of the stand-alone values rather than on the individual ones. This is in line with theory. These results are represented graphically in figure 5, which plots the average bid across treatments separating cases according to the stand-alone value of the proposer. Theory suggests that players send the same number as bid in the first stage of the game. Nevertheless our data show that bids are significantly different between players, although this difference is smaller in the asymmetric case as show in table 9.[8]

Table 4 shows the descriptive statistics for offers for all treatments. When considered together with the regression analysis in table 12 we can conclude that subjects tend to present balanced offers and do not make use of their bargaining power in an extreme way as predicted by theory. Nevertheless the observed changes in proposing behavior across treatments confirms our expectations, as proposers do offer significantly less as their bargaining power, i.e. their stand-alone value, increases. These results are also confirmed by the regression results reported in table 12 that combines the database and considers the two games together. Figures 1 and 2 represent the same results graphically. According to the estimated parameters in table 4 offers are sensibly smaller in the bid-and-propose game, that is in line with the theoretical results.

In the vast majority of the cases players notice the proposer's bargaining power and try to make advantage of it as described in the previous subsection, even if it is not done in an extreme way. Numbers presented in table 7 give more insight into this facts. In the symmetric ultimatum game, for example, 86% of the offers is smaller than the half of

[7]It is important to point out that the estimates of the second column in table 10 may be severely biased since the equilibrium bid changes radically from the symmetric to the asymmetric version even if the outside option remain constant and equal to 0.

[8]The difference between the symmetric and the asymmetric case is significant at any usual significance level.

the pie. It is quite difficult to explain why a proposer would offer more than half of the available money in such a situation, nevertheless it occurred in 14% of the times as shown in table 7. In the asymmetric treatments the distribution of offers concentrated over the upper or lower half of the support depending on the proposer's stand-alone value with some clear outliers. For instance, 14% of all the offers made by a proposer with stand-alone value of 5 were between 6.00 and 7.00 units. Again it is difficult to understand the reasoning behind these actions, since in these cases the proposer would gain more money with a rejection than with an acceptance. Still, he is sending a fairly generous offer to the chooser. A comment on our experimental design is now in order. The written instructions, the computer screens and also the answers delivered by the experimenter to the questions in the lab emphasized that offers represent the monetary amount that is offered to the chooser. Therefore the possibility of proposers behind these 14% not understanding the rules of the game is fairly small.

There is an interesting difference between proposals in the symmetric games. Table 4 shows that offers vary less in the bid-and-propose game. According to data in table 7 this fact is due to the lack of proposals lower than 1 or higher than 7. Extremely small offers are not made since in case of rejection the chooser would almost always get a slightly larger amount. Note that first-stage bids amount to 1.87 monetary units on average. Offers on the other extreme do not make sense according to game theory. Nevertheless, extremely high offers do occur in the ultimatum game and do not do so in the bid-and-propose game. Proposers might think they have earned the right to propose through the competition in the auction of the first stage and therefore feel less guilty about offering smaller amounts of money. This effect is also present in the asymmetric games: The regression analysis in tables 14 and 15 suggests that being a proposer does not imply higher payoffs in general (the estimated coefficients corresponding to "proposer" in the second column are not significant), but it does so in the bid-and-propose game. Moreover this difference is around 0.8 monetary units.

Given the results in table 14 we cannot confirm that the proposer enjoys a greater bargaining power. Even though it is not an equilibrium behavior, rejections do occur in the lab and with this the chooser is able to equilibrate the situation. This argument is confirmed by the estimation results in table 15 when considering the merged database and both the symmetric and the asymmetric games. In the bid-and-propose game the bargaining power is balanced by design, i.e. by the presence of the bidding stage prior to the ultimatum. If we look exclusively at the asymmetric games the proposer seems to enjoy a clear advantage in the bid-and-propose game.

Acceptance thresholds and therefore acceptance probabilities are expected to be increasing in the amount offered by the proposer. This tendency is present in table 7, even if not in a perfect way due to the small number of observations (and therefore to the relatively high variance of the data). Results from the regression analysis of acceptance decisions stated in table 13 show that the amount of the offer has a positive effect on the acceptance probability. In line with our expectations, data show that the chooser's stand-alone value and the proposer's first-stage bid (being a potential gain for the chooser) affect negatively the acceptance probabilities. Figures 4 and 5 deliver graphical argument concerning the acceptance rate. Even though our data does not allow us to perform a serious time series analysis graphs 1 through 4 suggest that choosers' behavior was more hectic than proposers', as if choosers tried to (unsuccessfully) achieve more generous offers, while proposers stuck to the same.

Connecting the three strategic parts: bidding, offers and acceptance rejection in the bid-and-propose game the following features are observed. From table 8 we can observe the maximum bids that are taking place. In the symmetric bid-and-propose game, all bids are at most equal to 5. Proposers can guarantee a payoff of at least 5, assuming the chooser accepts offers covering at least her outside option and the bid. Note that 95% of the offers in the symmetric bid-and-propose game are at most 5, but only 57% of them are accepted. In the asymmetric bid-and-propose games, bids are at most equal to 2 when the outside-option is equal to 0, and to 3 when the outside option is equal to 5. Again, assuming that choosers accept offers covering outside options and bids, a proposer with an outside option equal to 0 facing a chooser with an outside option equal to 5 can guarantee a payoff of at least 3 (the bid is at most 2), while a proposer with an outside option equal to 5 facing a chooser with an outside option equal to 0 can guarantee a payoff of at least 7 (the bid is at most 3). Proposers with outside option equal to 0 do not offer above 7, although only 62% of the offers are accepted. Proposers with outside option equal to 5 never offer above 5 (more generous than offering at most 3) and 84% of offers are accepted.

# 5 Conclusions

It seems that subjects agree on a 40-60 split of the pie, being the proposer the person getting the 60% of the pie when the game is symmetric or asymmetric in his favor, and the chooser otherwise for the ultimatum game. When looking at the bid-and-propose game, it seems that the division gets close to the 30-70 division, more extreme than in the ultimatum game, but not as extreme as the 25-75 division predicted by the theory.[9]

We can conclude that the higher the outside option for a player, the higher the share of the pie. The effect of the bidding stage on the final share of the pie is partially according to the theory. First, players do not bid the same quantity, as subgame perfection predicts, but do so depending on their value of their outside option. Second, recall that the rules of the game make the bid being paid by the proposer only in case of a rejection. This makes the chooser more powerful in the bid-and-propose bargaining procedure than in the simple ultimatum game. In light of the average payoffs, we cannot say that choosers do get higher payoffs (on average) in the bid and propose mechanism than in the ultimatum game. They do get higher payoffs only in the asymmetric cases where the proposer gets smaller outside option. Taking general averages, on either all offers or only accepting offers, proposers gain more than choosers in the bid-and-propose mechanism than in the simple ultimatum game. In light of the distribution of offers and acceptance-rejections decisions, we observe that, although choosers tend to reject more often in the low range of offers (less than half), offers tend to be lower in the bid-and-propose mechanism. These observations are consistent with previous experiments in which proposers tend to exploit more their position when they feel they have earned their position. On the other hand, the fact that choosers reject more often in the bid-and-propose mechanism (for the same

[9]The presence of an additional stage in the bid-and-propose game may constitute a feature that makes observations divert from the subgame perfect prediction, as those equilibria require complex computations from subjects. With our design we are unable to separate the effect of complexity from others that imply deviations from the predicted equilibrium behavior. We leave this question open for further analysis.

range of offers, looking at the lower half of them) is consitent with the fact that winning bids by the proposer become an instrument to give more power to the chooser in the offer stage. To some extant, the fact that choosers end up with lower payoff could be driven by the fact that they reject more. Nevertheless, proposers end up with higher payoffs in the bid-and-propose mechanism than in the ultimatum game, which suggests that the explotation effect is more important than the "protecting the chooser" effect expected from the theory.

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# 6 Tables

Table 1: Theoretical predictions: subgame perfect Nash equilibria. Bids of the two players coincide in the equilibrium of the bid-and-propose game. Acceptance: the chooser accepts any offer higher or equal to the threshold indicated in the table. $v_{CH}$ represents the stand-alone value of the chooser, it equals either 0 or 5.

| treatment | bids | offer | acceptance |
|---|---|---|---|
| treatment 1 | - | 0 | 0 |
| treatments 2-3 | - | $v_{CH}$ | $v_{CH}$ |
| treatment 4 | 5 | 5 | 5 |
| treatments 5-6 | 2.5 | $v_{CH} + 2.5$ | $v_{CH} + 2.5$ |

Table 2: Experimental design: Summary of treatments. Repetitions: number of practice rounds between parenthesis. Stand-alone-values: in the asymmetric cases the first number represents the value for the first 11 subjects, while the second the value for the second 11.

| | game | repetitions | stand-alone values |
|---|---|---|---|
| treatment 1 | ultimatum | (1)+5 | symmetric (0;0) |
| treatment 2 | ultimatum | (1)+5 | asymmetric (0;5) |
| treatment 3 | ultimatum | (0)+5 | asymmetric (5;0) |
| treatment 4 | bid-and-propose | (1)+10 | symmetric (0;0) |
| treatment 5 | bid-and-propose | (1)+5 | asymmetric (0;5) |
| treatment 6 | bid-and-propose | (0)+5 | asymmetric (5;0) |

Table 3: Efficiency results. Efficiency: proportion of acceptance decisions. Realized efficiency: sum of individual payoffs as a proportion of the total monetary amount to be distributed. Difference in efficiency between the two games: **Significant at 10%. **Significant at 5%. ***Significant at 1%.

| | | ultimatum | | bid-and-propose | |
|---|---|---|---|---|---|
| treatment | period | efficiency | realized efficiency | efficiency | realized efficiency |
| symmetric | 1 | 82%** | 82%** | 55%** | 55%** |
| | 2 | 82% | 82% | 64% | 64% |
| | 3 | 73%* | 73%* | 45%* | 45%* |
| | 4 | 82%* | 82%* | 55%* | 55%* |
| | 5 | 73% | 73% | 73% | 73% |
| | 6 | - | - | 64% | 64% |
| | 7 | - | - | 64% | 64% |
| | 8 | - | - | 82% | 82% |
| | 9 | - | - | 64% | 64% |
| | 10 | - | - | 36% | 36% |
| symmetric | 1-10 | 78%*** | 78%*** | 60%*** | 60%*** |
| asymmetric | 1 | 82% | 91% | 73% | 86% |
| | 2 | 77%** | 89% | 55%** | 77% |
| | 3 | 82% | 91% | 77% | 89% |
| | 4 | 82% | 91% | 86% | 93% |
| | 5 | 77% | 89% | 77% | 89% |
| asymmetric | 1-5 | 80% | 90% | 74% | 87% |

Table 4: Offers (EMU)

Part A: Ultimatum game

| | all | | | accepted | | | rejected | | |
|---|---|---|---|---|---|---|---|---|---|
| | symmetric | asymmetric | | symmetric | asymmetric | | symmetric | asymmetric | |
| | | $v_P = 0$ | $v_P = 5$ | | $v_P = 0$ | $v_P = 5$ | | $v_P = 0$ | $v_P = 5$ |
| mean | 4.09 | 5.71 | 3.87 | 4.41 | 6.03 | 3.91 | 2.92 | 4.93 | 3.55 |
| st.dev. | 1.71 | 1.11 | 2.55 | 1.73 | 0.79 | 2.44 | 1.01 | 1.39 | 3.51 |
| min | 1.00 | 1.00 | 1.00 | 1.00 | 5.10 | 1.00 | 1.00 | 1.00 | 1.00 |
| max | 9.00 | 10.00 | 10.00 | 9.00 | 10.00 | 10.00 | 4.25 | 6.00 | 10.00 |
| obs. | 55 | 59 | 51 | 43 | 42 | 46 | 12 | 17 | 5 |

Part B: Bid-and-propose game

| | all | | | accepted | | | rejected | | |
|---|---|---|---|---|---|---|---|---|---|
| | symmetric | asymmetric | | symmetric | asymmetric | | symmetric | asymmetric | |
| | | $v_P = 0$ | $v_P = 5$ | | $v_P = 0$ | $v_P = 5$ | | $v_P = 0$ | $v_P = 5$ |
| mean | 3.94 | 6.03 | 3.22 | 4.06 | 6.61 | 3.34 | 3.77 | 5.10 | 2.61 |
| st.dev. | 0.66 | 1.47 | 0.90 | 0.67 | 0.58 | 0.84 | 0.61 | 1.94 | 0.96 |
| min | 2.00 | 0.10 | 0.50 | 3.00 | 5.50 | 1.00 | 2.00 | 0.10 | 0.50 |
| max | 6.30 | 8.00 | 5.00 | 6.30 | 8.00 | 5.00 | 5.25 | 7.00 | 4.00 |
| obs. | 110 | 52 | 58 | 66 | 42 | 49 | 44 | 20 | 9 |

Table 5: Payoffs (EMU)

Part A: Ultimatum game

| | all | | | accepted | | | rejected | | |
|---|---|---|---|---|---|---|---|---|---|
| proposer | symmetric | asymmetric | | symmetric | asymmetric | | symmetric | asymmetric | |
| | | $v_P = 0$ | $v_P = 5$ | | $v_P = 0$ | $v_P = 5$ | | $v_P = 0$ | $v_P = 5$ |
| mean | 4.37 | 2.83 | 5.98 | 5.59 | 3.97 | 6.09 | 0.00 | 0.00 | 5.00 |
| st.dev. | 2.79 | 1.93 | 2.35 | 1.74 | 0.80 | 2.45 | 0.00 | 0.00 | 0.00 |
| min | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.00 |
| max | 9.00 | 4.90 | 9.00 | 9.00 | 4.90 | 9.00 | 0.00 | 0.00 | 5.00 |
| obs. | 55 | 59 | 51 | 43 | 42 | 46 | 12 | 17 | 5 |

Part B: Bid-and-propose game

| | all | | | accepted | | | rejected | | |
|---|---|---|---|---|---|---|---|---|---|
| proposer | symmetric | asymmetric | | symmetric | asymmetric | | symmetric | asymmetric | |
| | | $v_P = 0$ | $v_P = 5$ | | $v_P = 0$ | $v_P = 5$ | | $v_P = 0$ | $v_P = 5$ |
| mean | 2.54 | 1.81 | 6.17 | 5.94 | 3.39 | 6.66 | -2.56 | -0.72 | 3.51 |
| st.dev. | 4.25 | 2.11 | 1.45 | 0.68 | 0.59 | 0.85 | 0.90 | 0.70 | 1.06 |
| min | -5.00 | -2.00 | 2.00 | 3.70 | 2.00 | 5.00 | -5.00 | -2.00 | 2.00 |
| max | 7.00 | 4.50 | 9.00 | 7.00 | 4.50 | 9.00 | 0.00 | 0.00 | 4.99 |
| obs. | 110 | 52 | 58 | 66 | 32 | 49 | 44 | 20 | 9 |

Table 6: Payoffs (EMU)

Part A: Ultimatum game

| | all | | | accepted | | | rejected | | |
|---|---|---|---|---|---|---|---|---|---|
| chooser | symmetric | asymmetric | | symmetric | asymmetric | | symmetric | asymmetric | |
| | | $v_P = 0$ | $v_P = 5$ | | $v_P = 0$ | $v_P = 5$ | | $v_P = 0$ | $v_P = 5$ |
| mean | 3.45 | 5.73 | 3.53 | 4.41 | 6.03 | 3.91 | 0.00 | 5.00 | 0.00 |
| st.dev. | 2.40 | 0.82 | 2.61 | 1.74 | 0.80 | 2.45 | 0.00 | 0.00 | 0.00 |
| min | 0.00 | 5.00 | 0.00 | 1.00 | 5.10 | 1.00 | 0.00 | 5.00 | 0.00 |
| max | 9.00 | 10.00 | 10.00 | 9.00 | 10.00 | 10.00 | 0.00 | 5.00 | 0.00 |
| obs. | 55 | 59 | 51 | 43 | 42 | 46 | 12 | 17 | 5 |

Part B: Bid-and-propose game

| | all | | | accepted | | | rejected | | |
|---|---|---|---|---|---|---|---|---|---|
| chooser | symmetric | asymmetric | | symmetric | asymmetric | | symmetric | asymmetric | |
| | | $v_P = 0$ | $v_P = 5$ | | $v_P = 0$ | $v_P = 5$ | | $v_P = 0$ | $v_P = 5$ |
| mean | 3.46 | 6.27 | 3.05 | 4.06 | 6.61 | 3.34 | 2.56 | 5.72 | 1.49 |
| st.dev. | 1.06 | 0.76 | 1.10 | 0.68 | 0.59 | 0.85 | 0.90 | 0.70 | 1.06 |
| min | 0.00 | 5.00 | 0.01 | 3.00 | 5.50 | 1.00 | 0.00 | 5.00 | 0.01 |
| max | 6.30 | 8.00 | 5.00 | 6.30 | 8.00 | 5.00 | 5.00 | 7.00 | 3.00 |
| obs. | 110 | 52 | 58 | 66 | 32 | 49 | 44 | 20 | 9 |

Table 7: Distribution of offers and acceptance-rejection decisions (%)

Part A: Ultimatum game

| | symmetric | | | asymmetric - $v_P = 0$ | | | asymmetric - $v_P = 5$ | | |
|---|---|---|---|---|---|---|---|---|---|
| offer ($\leq$) | all | accepted | rejected | all | accepted | rejected | all | accepted | rejected |
| 1.00 | 5 | 67 | 33 | 2 | 0 | 100 | 8 | 50 | 50 |
| 2.00 | 7 | 25 | 75 | 2 | 0 | 100 | 27 | 100 | 0 |
| 3.00 | 13 | 57 | 43 | 0 | - | - | 22 | 82 | 18 |
| 4.00 | 33 | 83 | 17 | 2 | 0 | 100 | 16 | 100 | 0 |
| 5.00 | 27 | 87 | 13 | 3 | 0 | 100 | 0 | - | - |
| 6.00 | 4 | 100 | 0 | 71 | 71 | 29 | 2 | 100 | 0 |
| 7.00 | 5 | 100 | 0 | 17 | 100 | 0 | 14 | 100 | 0 |
| 8.00 | 0 | - | - | 4 | 100 | 0 | 6 | 100 | 0 |
| 9.00 | 5 | 100 | 0 | 0 | - | - | 2 | 100 | 0 |
| 10.00 | 0 | - | - | 2 | 100 | 0 | 4 | 100 | 0 |
| Total | 100 | 78 | 22 | 100 | 71 | 29 | 100 | 90 | 10 |

Part B: Bid-and-propose game

| | symmetric | | | asymmetric - $v_P = 0$ | | | asymmetric - $v_P = 5$ | | |
|---|---|---|---|---|---|---|---|---|---|
| offer ($\leq$) | all | accepted | rejected | all | accepted | rejected | all | accepted | rejected |
| 1.00 | 0 | - | - | 4 | 0 | 100 | 3 | 50 | 50 |
| 2.00 | 2 | 0 | 100 | 0 | - | - | 10 | 83 | 17 |
| 3.00 | 13 | 57 | 43 | 2 | 0 | 100 | 40 | 78 | 22 |
| 4.00 | 56 | 53 | 47 | 2 | 0 | 100 | 38 | 91 | 9 |
| 5.00 | 25 | 78 | 22 | 4 | 0 | 100 | 9 | 100 | 0 |
| 6.00 | 4 | 75 | 25 | 33 | 41 | 59 | 0 | - | - |
| 7.00 | 1 | 100 | 0 | 52 | 85 | 15 | 0 | - | - |
| 8.00 | 0 | - | - | 4 | 100 | 0 | 0 | - | - |
| 9.00 | 0 | - | - | 0 | - | - | 0 | - | - |
| 10.00 | 0 | - | - | 0 | - | - | 0 | - | - |
| Total | 100 | 60 | 40 | 100 | 62 | 38 | 100 | 84 | 16 |

Table 8: Bids (EMU) in the bid-and-propose game. $v$ - stand-alone value (0/5)

| | symmetric | asymmetric | | |
|---|---|---|---|---|
| | | all | $v = 0$ | $v = 5$ |
| mean | 1.87 | 0.50 | 0.39 | 0.65 |
| st.dev. | 1.06 | 0.69 | 0.50 | 0.81 |
| min | 0.00 | 0.00 | 0.00 | 0.00 |
| max | 5.00 | 3.00 | 2.00 | 3.00 |
| obs. | 220 | 220 | 110 | 110 |

Table 9: Difference between bids (EMU) in the bid-and-propose game. Differences are measured in absolute value between the two players. $v$ - stand-alone value (0/5)

| | symmetric | asymmetric |
|---|---|---|
| mean | 1.25 | 0.68 |
| st.dev. | 0.99 | 0.73 |
| min | 0.00 | 0.00 |
| max | 4.99 | 3.00 |
| obs. | 220 | 220 |

Table 10: Regression analysis of bids. Dependent variable: bids. Regressors: $v$ - stand-alone value (0/5); $v_{other}$ - stand-alone value of the other player. Coefficient: ***Significant at 1%.

| | bid-and-propose | | |
|---|---|---|---|
| | asymmetric | all | all |
| constant | 0.39*** | 1.36*** | 1.87*** |
| $v$ | 0.06*** | -0.14*** | - |
| $v + v_{other}$ | - | - | -0.27*** |
| obs. | 220 | 440 | 440 |
| $R^2$ | 0.05 | 0.07 | 0.37 |
| adj. $R^2$ | 0.05 | 0.07 | 0.37 |
| p-value (F-test) | 0.00 | 0.00 | 0.00 |

Table 11: Auction results in the bid-and-propose game. Number of cases and %. $v$ - stand-alone value (0/5)

| $v$ | proposer | chooser | total |
|---|---|---|---|
| 0 | 58 | 52 | 110 |
| | 26.36% | 23.64% | 50.00% |
| 5 | 52 | 58 | 110 |
| | 23.64% | 26.36% | 50.00% |
| total | 110 | 110 | 220 |
| | 50.00% | 50.00% | 100.00% |

Table 12: Regression analysis of offers. Dependent variable: offer. Regressors: $v$ - stand-alone value (0/5). Coefficient: **Significant at 5%. ***Significant at 1%.

| game | ultimatum | | bid-and-propose | | all (merged data) | |
|---|---|---|---|---|---|---|
| treatments | all | asymmetric | all | asymmetric | all | asymmetric |
| constant | 4.93*** | 5.71*** | 5.34*** | 5.75*** | 4.93*** | 5.71*** |
| $v$ | -0.21*** | -0.37*** | -0.36*** | -0.61*** | -0.21*** | -0.37*** |
| $b$ | - | - | -0.25*** | 0.53*** | -0.25** | 0.53** |
| $b_{other}$ | - | - | -0.28** | -0.13 | -0.28* | -0.13 |
| b-a-p | - | - | - | - | 0.41 | 0.03 |
| $v$·b-a-p | - | - | - | - | -0.15** | -0.25*** |
| obs. | 165 | 110 | 220 | 110 | 385 | 220 |
| $R^2$ | 0.06 | 0.19 | 0.28 | 0.62 | 0.16 | 0.38 |
| adj. $R^2$ | 0.05 | 0.18 | 0.27 | 0.61 | 0.15 | 0.36 |
| p-value (F-test) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Table 13: Regression analysis of acceptance decisions. Dependent variable: accept/reject (0/1). Regressors: $v$ - stand-alone value (0/5); $b$ - bid in the first stage; $b_{other}$ - bid of the other player in the first stage; $o$ - offer by the proposer. Coefficient: *Significant at 10%. **Significant at 5%. ***Significant at 1%.

| game | ultimatum | | bid-and-propose | | all (merged data) | |
|---|---|---|---|---|---|---|
| treatments | all | asymmetric | all | asymmetric | all | asymmetric |
| constant | -0.02 | 0.72 | -2.08** | -3.95*** | -1.02** | -0.94 |
| $v$ | -0.38*** | -0.54*** | -1.32*** | -2.87*** | -0.59*** | -1.12*** |
| $o$ | 0.50*** | 0.51** | 1.63*** | 3.30*** | 0.87*** | 1.32*** |
| $b$ | - | - | 0.19 | 0.48 | 0.15 | -0.81 |
| $b_{other}$ | - | - | -1.51*** | -3.17*** | -1.06*** | -1.49*** |
| b-a-p | - | - | - | - | 0.70 | 0.44 |
| $v$·b-a-p | - | - | - | - | -0.19 | -0.13 |
| obs. | 165 | 110 | 220 | 110 | 385 | 220 |
| pseudo $R^2$ | 0.09 | 0.12 | 0.20 | 0.47 | 0.15 | 0.24 |
| p-value ($\chi^2$-test) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Table 14: Regression analysis of final payoffs. Dependent variable: final payoff. Regressors: proposer is a dummy variable that takes value 1 in case the observation belongs to a proposer, 0 otherwise; $v$ - stand-alone value (0/5); b-a-p is a dummy variable that takes value 1 in case of the bid-and-propose game, 0 otherwise; $b$ - bid in the first stage of the bid-and-propose game (equals 0 in the ultimatum game); $b_{other}$ - bid of the other player in the first stage of the bid-and-propose game (equals 0 in the ultimatum game). Coefficient: **Significant at 5%. ***Significant at 1%.

| game | ultimatum and bid-and-propose (merged data) | | | | | |
|---|---|---|---|---|---|---|
| player | both | | proposer | | chooser | |
| treatments | all | asymmetric | all | asymmetric | all | asymmetric |
| constant | 3.46*** | 3.27*** | 3.57*** | 2.83*** | 3.49*** | 3.52*** |
| $v$ | 0.47*** | 0.54** | 0.48*** | 0.63*** | 0.45*** | 0.44*** |
| b-a-p | -1.13*** | -1.20*** | -0.71 | -0.34 | -1.07*** | -1.02*** |
| $v$·b-a-p | 0.28*** | 0.29*** | 0.29** | 0.33*** | 0.27*** | 0.25*** |
| proposer | 0.14 | -0.22 | - | - | - | - |
| proposer·b-a-p | 0.46 | 0.89** | - | - | - | - |
| $b$ | -0.00 | -0.08 | -0.62*** | -0.97*** | -0.00 | 0.10 |
| $b_{other}$ | 0.49** | 0.67*** | 0.67** | -0.61 | 0.45*** | 0.50** |
| proposer·$b$ | -0.62 | -0.71 | - | - | - | - |
| proposer·$b_{other}$ | 0.16 | -1.47*** | - | - | - | - |
| obs. | 770 | 440 | 385 | 220 | 385 | 220 |
| $R^2$ | 0.28 | 0.50 | 0.40 | 0.53 | 0.40 | 0.48 |
| adj. $R^2$ | 0.27 | 0.49 | 0.39 | 0.52 | 0.39 | 0.47 |
| p-value (F-test) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Table 15: Regression analysis of final payoffs when acceptance occured. Dependent variable: final payoff. Regressors: proposer is a dummy variable that takes value 1 in case the observation belongs to a proposer, 0 otherwise; $v$ - stand-alone value (0/5); b-a-p is a dummy variable that takes value 1 in case of the bid-and-propose game, 0 otherwise; $b$ - bid in the first stage of the bid-and-propose game (equals 0 in the ultimatum game); $b_{other}$ - bid of the other player in the first stage of the bid-and-propose game (equals 0 in the ultimatum game). Coefficient: **Significant at 5%. ***Significant at 1%.

| game | ultimatum and bid-and-propose (merged data) | | | | | |
|---|---|---|---|---|---|---|
| player | both | | proposer | | chooser | |
| treatments | all | asymmetric | all | asymmetric | all | asymmetric |
| constant | 4.25*** | 3.91*** | 4.79*** | 3.97*** | 4.15*** | 3.91*** |
| $v$ | 0.32*** | 0.42*** | 0.26*** | 0.42*** | 0.38*** | 0.42*** |
| b-a-p | -0.93*** | -1.13*** | -0.62* | -0.30 | -1.25*** | -1.13*** |
| $v$·b-a-p | 0.22*** | 0.29*** | 0.16** | 0.29*** | 0.32*** | 0.29*** |
| proposer | 0.44** | 0.06 | - | - | - | - |
| proposer·b-a-p | 0.11 | 0.83** | - | - | - | - |
| $b$ | -0.04 | -0.10 | 0.31* | -0.58** | -0.04 | -0.10 |
| $b_{other}$ | 0.33** | 0.58** | 0.42** | 0.10 | 0.49*** | 0.58** |
| proposer·$b$ | 0.39 | -0.48 | - | - | - | - |
| proposer·$b_{other}$ | 0.18 | -0.48 | - | - | - | - |
| obs. | 556 | 338 | 278 | 169 | 278 | 169 |
| $R^2$ | 0.35 | 0.50 | 0.23 | 0.49 | 0.41 | 0.49 |
| adj. $R^2$ | 0.34 | 0.49 | 0.21 | 0.48 | 0.40 | 0.48 |
| p-value (F-test) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Figure 1: Evolution of offers in the ultimatum game

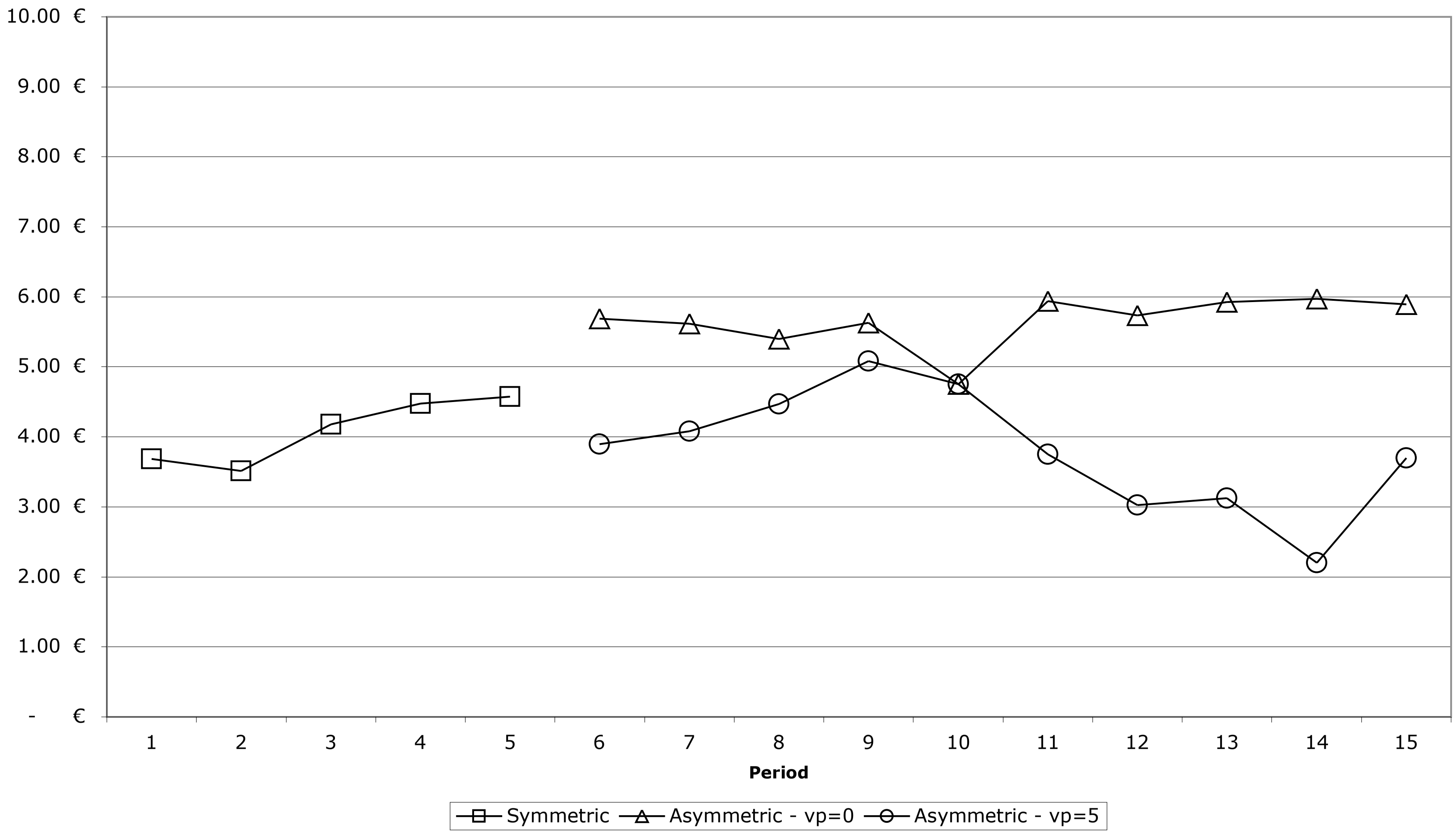


Figure 2: Evolution of offers in the bid-and-propose game

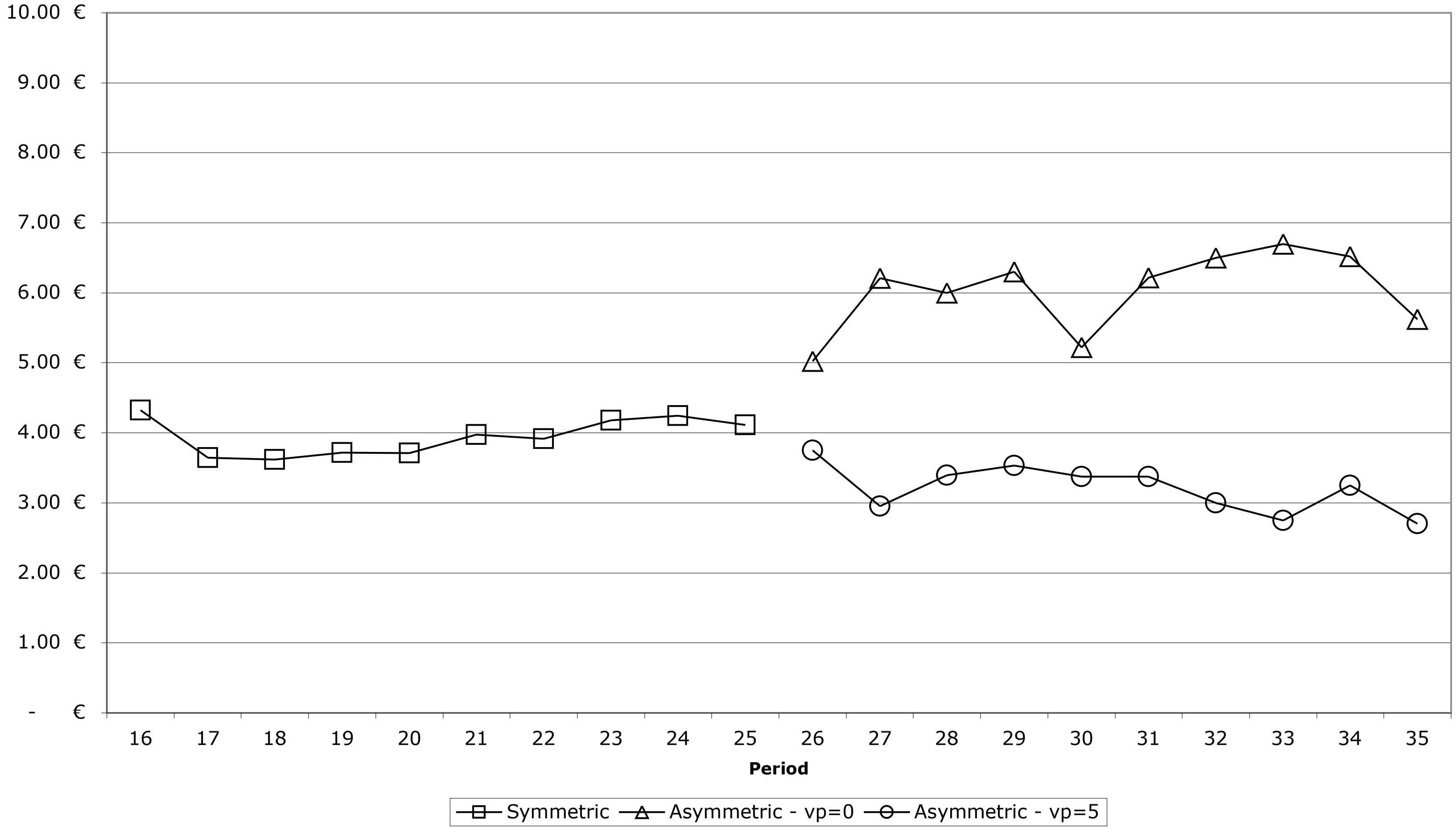


Figure 3: Evolution of acceptance rate in the ultimatum game

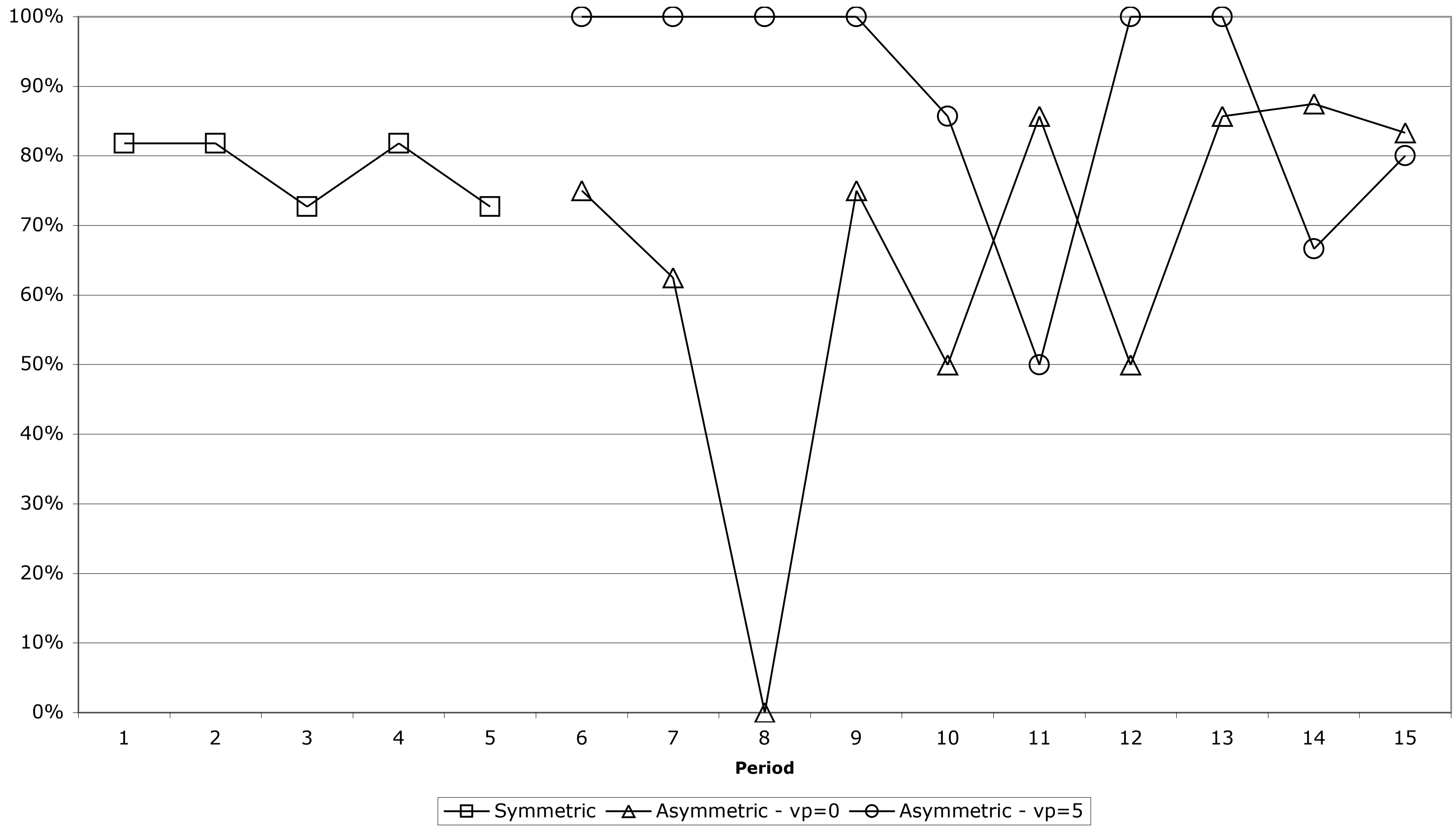


Figure 4: Evolution of acceptance rate in the bid-and-propose game

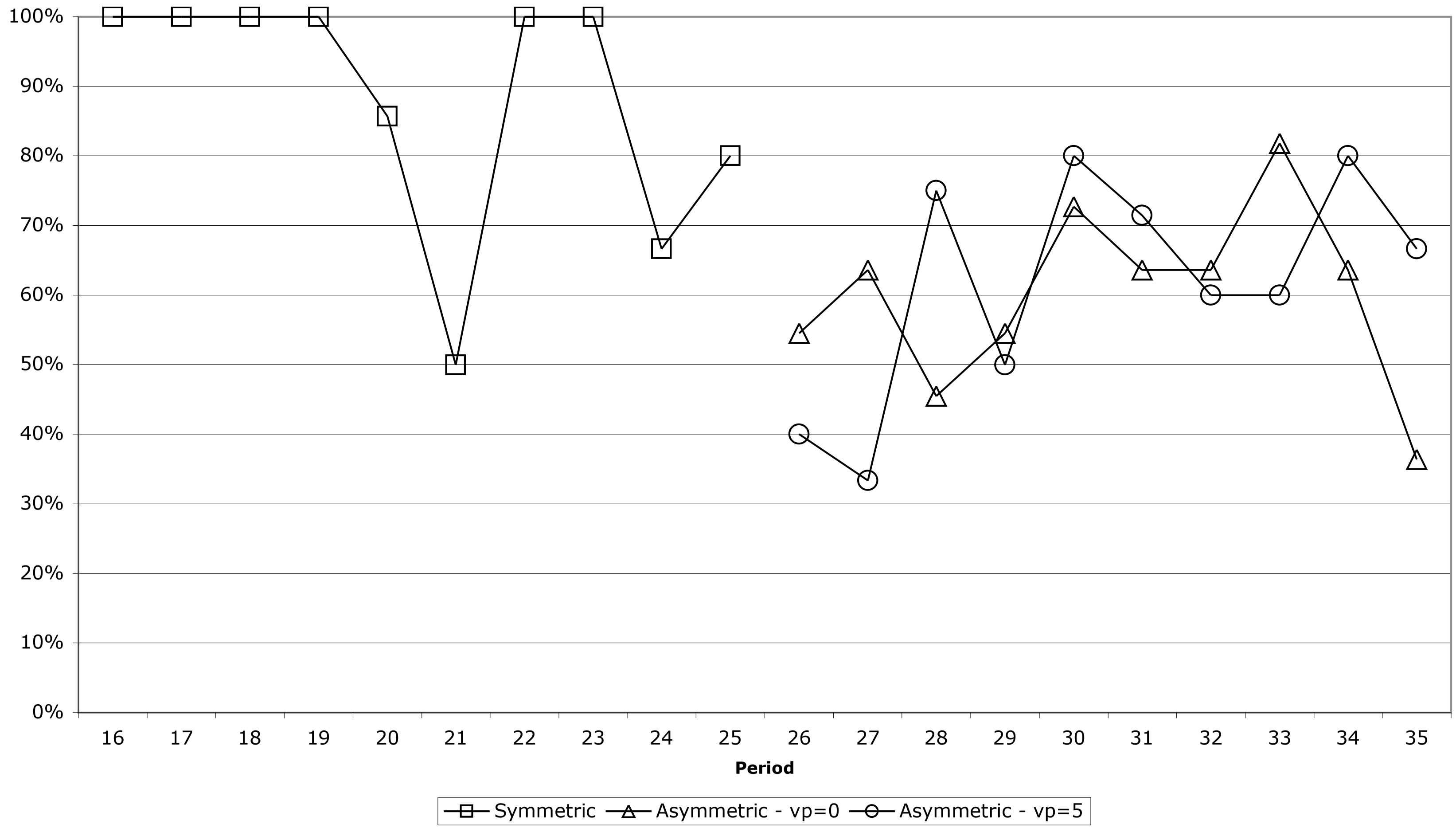
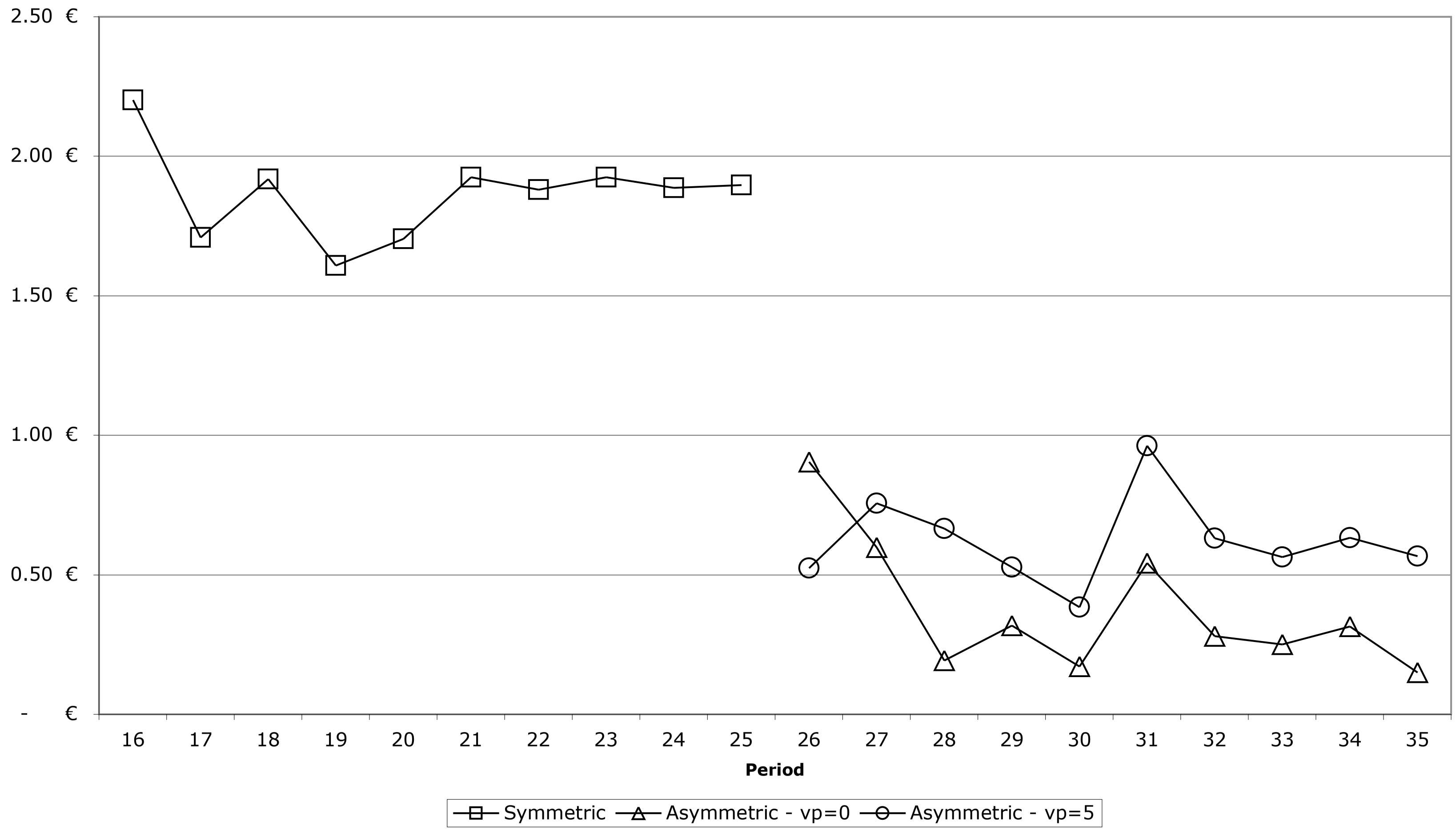


Figure 5: Evolution of bids in the bid-and-propose game



# 7 Instructions

Thank you for participating in this experiment.[10] This session has 4 different games. Before each of them the corresponding instructions will be read aloud and we will answer the questions that may arise. Afterwards we will play a trial period and then other 5-10 periods that will determine a part of the money that you will receive by the end of the experiment.

In each game and in each repetition groups of two people will be formed randomly. Therefore it is very likely that you will be playing with a different person in each repetition. Your task is to make individual decisions about how to share a certain amount of money and for this reason you are not allowed to talk to other participants. The result of your choices will affect the amount of money that you earn in each game. 100 experimental monetary units will be exchanged for 8.5 euros. Remember that apart from that you get 3 euros from participating in the experiment.

## 7.1 Game 1

In this game the computer will randomly assign the roles of "proposer" and "chooser" between the two players that form the group. The "proposer" will have to decide how to divide 10 monetary units. Then the "chooser" can express his agreement or disagreement with the proposal.

If you are the "proposer" you will have to choose a number between 0 and 10 (numbers up to two decimals permitted) that represents the amount that you offer to the other player of your group. Write your proposal in the purple cell of the table that appears on the top of the screen and click on "OK".

The "chooser" will receive the offer and will have to decide whether to accept it or reject it. In case of acceptance the proposed split of the 10 monetary units will be implemented. In case of rejection both the "proposer" and the "chooser" will get 0 monetary units. For this reason we say that players alone can obtain 0, while together they can obtain 10 monetary units.

[10] Translated from Spanish.

In order to make your decision easier each screen offers additional information on the bottom part. On the “proposer”'s screen you can compute the final payoffs for different hypothetical situations just by writing an offer in the purple cell of the table on the bottom and clicking “Compute”. Results of the hypothetical game will appear immediately on the right showing payoffs in case of acceptance and rejection. The “chooser”'s screen also includes an informative table on the bottom that shows payoffs in case of acceptance and rejection.

Once decisions have been made a screen with the results will appear. By clicking on “OK” you proceed to the next repetition of the game in which other 10 monetary units will have to be shared.

## 7.2 Game 2

The rules of this game are identical to the rules of the previous one, but in case of rejection one of the players will get 5 monetary units, while the other will get 0 as before.

After the trial period you will play 10 repetitions of this game. In 5 of these repetitions you will be the player who gets 0 monetary units in case of rejection (while your adversary, who, remember, is a different person in each repetition, gets 5). In the other 5 repetitions you will be the player who gets 5 monetary units in case of rejection (now it is the other player in your group who gets 0).

## 7.3 Game 3

This game is based in the previous one, but it has an extra stage previous to the money division. In this case it won't be the computer, but the two players in each group who decide who will be the “proposer” and who will be the “chooser”. This decision is made through a special auction.

In the first stage of the game players will have to choose their bids: a number between 0 and 10 (numbers up to two decimals permitted). The player withe the largest bid will become the “proposer”, while the other will be the “chooser”. Since this is a special auction, bids are not paid in the first period of this game. In case of a tie the computer will assign the roles randomly.

In the second stage the “proposer” will have to choose his proposal that later the “chooser” either accepts or rejects. In case of acceptance the proposed split is implemented. In case of rejection the 10 monetary units are lost, moreover the “proposer” will have to pay his bid (the one that he won the first stage auction with) to the “chooser”. That is, players individually can achieve 0, while together 10 monetary units.

In order to make your decision easier each screen includes simulation tables (or informative tables) on the bottom part. Use the “Compute” button to study the final payoffs of the game in several hypothetical cases.

After finishing the game the screen with the results will appear. In you click on “OK” the computer will proceed to the next repetition of the game.

### 7.4 Game 4

The rules of this game are identical to the rules of the previous one, but in case of rejection one of the players will get 5 monetary units, while the other will get 0 as before. Moreover, in case of rejection the “proposer” will have to pay his bid to the “chooser” just as before.

After the trial period you will play 10 repetitions of this game. In 5 of these repetitions you will be the player who gets 0 monetary units in case of rejection (while your adversary, who, remember, is a different person in each repetition, gets 5). In the other 5 repetitions you will be the player who gets 5 monetary units in case of rejection (now it is the other player in your group who gets 0).