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AN EXPERIMENTAL COMPARISON BETWEEN FREE NEGOTIATION AND MULTI-ISSUE POINT MECHANISM

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Abstract

We propose a multi-issue point mechanism to be used in conflict resolution situations. This mechanism extract "gains from trade" inherent in the differing valuation towards the various issues where conflict exists. In order to assess the performance of this mechanism *vis-a-vis* unconstrained communication, we run a series of controlled laboratory experiments and find that both mechanisms reach similar levels of welfare, but the multi issue point mechanism allows subjects to reach an agreement more swiftly. In order to analyse in detail the performance of both mechanisms we introduce a classical measure of conflict and see that when conflict is highest, free negotiation sustains most losses: (1) subjects need more time to reach an agreement; (2) the likelihood of gridlock (no agreement) increases.

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1 Introduction

Negotiations between two parties are an important recurring element in our lives. Buyer and seller, political parties setting the agenda, an international dispute, a bilateral agreement in arms/pollution reduction, a country with two legislative chambers governed by opposing parties or a clash between the management and the union of a particular firm, are just a few examples. The process, outcome and success of negotiations depend on the characteristics of the setup.

One of the key characteristics in any negotiation is the number of items over which disagreement exists Whenever negotiations occur in a single dimension (such as setting the price in a buyer/seller transaction) gains for one party are losses for the other party. Instead, negotiations with multiple dimensions allow strict Pareto improvements. In such situations parties need to "assess tradeoffs in terms of how much to give up in [...] one issue in order to obtain a specified gain in another issue"[1]. Precisely, a central aspect in negotiations literature is whether negotiating parties can exploit the gains of trade inherent in their different valuation of the issues (see for instance Fisher and Ury, and Pattan, 1981, Bazerman and Neale, 1983, Keeney and Raiffa (1991), Thompson, 2000).

Motivated by the same idea, there is burgeoning literature on voting rules that allow voters to trade off their intensities of preferences in order to influence the final outcome on several issues (see for instance Brams and Taylor, 1996 and 1999, Casella, 2005, Jackson & Sonnenschein, 2007, and Hortala-Vallve, 2007). In this literature similar mechanisms are discussed applying game theory, in which voters allocate their votes across several decisions. By linking decisions, relative intensities across issues are elicited and strict Pareto improvements with respect to Majority Rule are realized.

The goal of this paper is to build a link between the literature of the two branches, (free) negotiation and the voting literature on multiple issues, and propose the application of a particular voting mechanism as a helpful negotiation tool. We design a set of experiments and compare the outcomes reached by free negotiation to those obtained with the *multi issue point mechanism* (hereafter MIPM) where two conflicting parties can unilaterally trade off their influence across the various issues at stake.[2] We replicate the same situations under both negotiating protocols in order to compare and evaluate the advantages of each mechanism. We vary the number of dimensions over which conflict exists in order to study the effects of this variable in our comparison.

MIPM endows each of the two bargaining party with a budget of votes which each of them has to distribute across a set of given issues simultaneously (analogously to the Adjusted Winner and related mechanisms).

[1] Keeney and Raiffa (1991)
[2] This mechanism is essentially the one proposed in Hortala-Vallve (2009).

Conflicting parties have opposing preferences so that one party wants all the issues to be approved and the opposing party wants them all to be dismissed. The party that invests most votes on a given issue is *decisive* on that issue. In the case of a tie, the issue is approved or dismissed with equal probability. By unilaterally trading off bargaining power from less preferred issues to more preferred issues, parties can extract the gains from trade inherent in their differing relative intensities. Throughout each party privately knows his own payoff for each issue in case he wins an issue, but does not know the valuations of his opponent.

In free negotiation the parties get the same information but are now allowed to communicate via the computer terminals. This allows subjects to send written messages and propose final allocations..

Running our experiments in the laboratory allows us to control and parallel the given information in each setting, e.g. preferences, knowledge about each other's preferences, timing, etc. Moreover, in the free negotiation treatments we restrict subjects to communicate in written form by using computer terminals, and so a record exists of every single move (e.g. who makes the first offer, how much information is disclosed, whether subjects are truthful, etc.) thereby avoiding non-verbal queues which are difficult to measure and incorporate in a quantitative analysis. Unlike case studies, we use abstract wordings for issues, e,g. issue 1, 2.. and simply present payoff tables indicating the subjects' earnings when they win an issue.

We first find that the average payoffs reached by subjects in both experimental treatments are similar. This alone is noteworthy given that in contrast to free negotiation, there is no direct communication among subjects in the MIPM. We also find that when subjects freely negotiate, the time they need to reach an agreement is considerably longer than when they use the MIPM. In other words, both mechanisms reach similar outcomes but unconstrained negotiation does so in a much more costly manner. The analysis of our experimental sessions then focuses on a detailed comparison of both mechanisms and tries to explain the source of our results.

One of the novelties of this paper is the application of a classical measure of conflict (Axelrod, 1967) to a negotiation situation. This measure captures the gains from trade inherent in any conflicting situations and therefore helps to compare very different situations and the two mechanism. In our case it allows to classify our observations in terms of the level of conflict regardless of the specific payoffs or the number of issues parties are bargaining over. We see that the level of conflict establishes an upper bound on the amount of payoff subjects can achieve. Furthermore, in free negotiation, the higher the conflict, the more difficulties negotiating parties will have and thus the more time they need in reaching an agreement. We also observe that *gridlock* (no agreement in negotiations) is most likely for high levels of conflict and this is precisely the source of payoff difference with the *multi issue point mechanism*. The lack of communication in the latter mechanism avoids parties realizing inherent conflict, and circumvents gridlock by allowing parties to realize the low (but existing) gains from trade in a short period of time.

The potential application of the voting mechanism as a negotiating tool is appealing as it mimics the heuristics that lead to good agreements by inducing integrative bargaining across the various dimensions. Firstly, MIPM forces parties to consider all issues simultaneously.[3] Secondly, as shown in Hortala-Vallve & Llorente-Saguer (2010) where MIPM is extensively analyzed, subjects invest more votes in the issues they care most about and by doing so, reach the desirable welfare properties of the mechanism (even when they are far from playing equilibrium strategies). Precisely, our experimental results support the use of MIPM in conflict resolution situations over many dimensions.

The paper is structured as follows: Section 1.1 presents some related literature; Section 2 introduces MIPM and a measure of conflict; Section 3 describes the experimental design; Section 4 presents the experimental result; and Section 5 concludes.

1.1 Related literature

The literature on negotiating practices spans several decades and methodologies. Important contributions have been summarized in a number of textbooks (see for instance, Bazerman & Neale, 1992; Fisher & Ury, 1981; Lewicki, Litterer, Minton, & Saunders, 1997; Murnighan, 1991; Raiffa, 1982; Thompson, 1998). However, to the best of our knowledge there are no comparisons to mechanisms that may improve the allocation between both parties. There is, however, some theoretical literature that studies software designed to support various negotiation activities, called negotiation support systems (see Bui, 1994; Holsapple and Whinston, 1996; Kilgour, 1996). One could interpret the mechanism we propose as one of such negotiation support systems.

There is also a growing amount of literature from experimental economics and psychology that studies negotiating (or bargaining) practices. The majority of this experimental literature draws on the *ultimatum game* where one party decides his share of a prize but needs the approval of the recipient for the remainder of the prize (see seminal paper Guth et al, 1982; excellent surveys on the ultimatum game can be found in Roth, 1995, or Camerer, 2003). Departing from this work, there is growing literature that looks at multidimensional situations and that, in particular, tests the mechanisms referred to in the introduction. Hortala-Vallve and Llorente-Saguer (2010) test the MIPM proposed in Hortala-Vallve (2009); Daniel and Parco (2005) and Schneider and Kramer (2004) test the adjusted winner, proposed in Brams and Taylor (1996, 1999); Casella et al (2006, 2008) test storable votes, mechanism proposed in Casella (2004); and Engelmann and Grimm (2008) test the linking mechanism proposed in Jackson and Sonnenschein (2007). Except for the experiments on the adjusted winner – which lack a game-theoretical prediction - these latter papers conclude that although subjects depart from theoretical behavior, welfare levels are remarkably close to theoretical predictions.

[3] Considering issues simultaneously is one of the keys of reaching integrative bargaining. See for instance Erickson *et al* (1974), Kelley (1966), Pruitt (1981) or Yukl *et al* (1976).

2 Multi-issue point mechanism and a measure of conflict

This section consists of two parts. In the first part we describe our multi-issue point mechanism and in the second we introduce a measure of conflict of interest.

2.1 The multi-issue Point Mechanism

We follow the setup presented in Hortala-Vallve(2007) and Hortala-Vallve & Llorente-Saguer (2010). Two agents have opposing views over N ($N \geq 2$) issues that need to be approved or dismissed. Monetary transfers are not allowed. Each agent privately knows his preferences and the prior distribution from which they are drawn is common knowledge.

Agents and issues are denoted $i \in \{1,2\}$ and $n \in \{1,2,...N\}$, respectively. Agent i's valuation towards issue n is denoted $\theta_i^n \in \mathbb{R}^+$. The preference vector of agent i is denoted $\theta_i = \left(\theta_i^1,...,\theta_i^N\right)$ and his payoff on issue n is described as follows,

$$\begin{cases} \theta_i^n \text{ if his will is implemented in issue n} \\ 0 \text{ if his opponent's will is implemented in issue n} \end{cases}$$

The total payoff is the sum of the individual payoffs across the N issues. Implicit in our model is the assumption that valuations are independent across issues and no complementarities exist. While we need this assumption for our result to hold, we can consider any linear transformation of the payoffs.

Without loss of generality we assume that agent i wishes the approval of all issues and agent j wishes their dismissal. Throughout we keep the interpretation that agents are deciding simultaneously over the approval or dismissal of various issues. However, our model could also be interpreted as a situation where two agents are auctioning N indivisible objects.

We analyse two mechanisms. In the first, agents are endowed with P indivisible points that can be freely distributed between the issues. The number of points is fixed and independent of the number of issues. The action space is the collection of voting profiles:

$$\left\{\left(p^1,...,p^N\right) \in \{0,1,...,P\}^N : p^1 + ... + p^N = P\right\}.$$

Hereafter we call this mechanism the *multi-issue point mechanism (MIPM)*. An important feature of this mechanism is that it allows each agent to implement his will on issues where he invests more points than his opponent. Ties are broken with the toss of a fair coin. That is,

$$\begin{cases} p_i^n > p_j^n \Rightarrow \textit{agent } i \textit{ decides on issue } n \\ p_i^n < p_j^n \Rightarrow \textit{agent } j \textit{ decides on issue } n \\ p_i^n = p_j^n \Rightarrow \textit{each agent decides on issue } n \textit{ with equal probability} \end{cases}$$

Our second mechanism is unrestricted negotiation. Agents can communicate (cheap talk) and need to reach a unanimous decision on whether a specific issue is approved, dismissed or tied. In this scenario, if an agreement is not reached in a predetermined amount of time, a status quo outcome (where all issues are tied) is implemented.

In order to describe the behaviour of both mechanisms to different settings we need a way to measure the degree of conflict of our two player games. For this purpose, we adapt the measure of *Conflict of Interest* (CI) developed by Axelrod (1967). This index is highest when there are no gains of trade among subjects (i.e. when they both equally value all issues); instead, it is lowest when there are plenty of gains from trade and both subjects can reach their maximum utility.

2.2 *A measure of the* Conflict of Interest

Given a two-person game, we can construct the *utility possibility frontier* which is denoted G(x); G(x) is the maximum utility player 2 can reach when player 1 gets x. This function is defined for x greater than the minimum possible payoff ($\underline{\pi}$) and smaller than the highest possible payoff ($\overline{\pi}$). However, the games our subjects play only have a finite set of outcomes, thus G(x) is not defined in all its range. In order to simplify our analysis we convexify the set of outcomes so that the utility possibility frontier is now continuous. Note that convexifying the set of outcomes is analogous to allowing lotteries when subjects have von-Neumann Morgenstern utilities.

A game that allows both players reach their maximum utility simultaneously should be viewed as a game of very little conflict; instead, a game where the gains for one player are losses to his opponent should be viewed as a game of high conflict. The former corresponds to a game of coordination and the latter to a constant sum game. Our measure of conflict captures how close we are from a constant-sum game where no gains from trading issues are possible. This is calculated by computing the area between the maximum utility agent 1 can reach and the utility possibility frontier G(x). Formally it reads as follows:

$$CI = \frac{2}{(\bar{\pi} - \underline{\pi})^2} \int_{\underline{\pi}}^{\bar{\pi}} (\bar{\pi} - G(x)) dx,$$

where the term before the integral is simply a normalisation so that our index is between 0 and 1. A higher CI indicates that there is a large amount of conflict and a lower CI indicates that there is low level of conflict among the two players.

Below in Figure 1 we depict a situation where agent 1 has preferences (450,50,150) and agent 2 has preferences (50,250,300) –note that $\bar{\pi} = 600$ and $\underline{\pi} = 0$. The stars show the pair of utilities associated to each outcome. For instance, the outcome where agent 1 decides on the first issue and agent 2 decides on the second and third issues is depicted as the utility pair (400,550). The shaded area (in yellow) is, once normalised, the CI of this particular game. In red, we see the utility possibility frontier of a pure coordination game where both agents can achieve the maximum utility thus the conflict is minimum (CI = 0); in blue we can see the utility possibility frontier of a constant sum game where conflict is maximum (CI = 1).

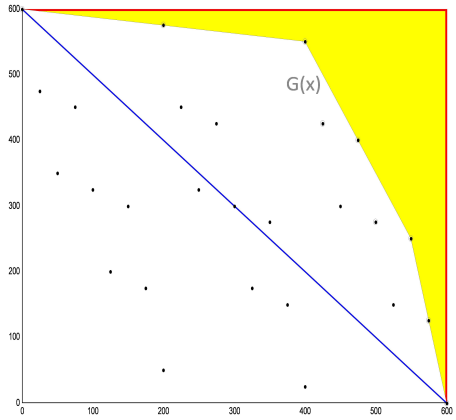

Figure 1: Utility pairs associated to all possible outcomes when two agents have preferences (400, 50,150) and (50,250,300); G(x) denotes the possibility frontier of the convexified set of outcomes.

Figure 1 shows that CI captures how far the set of utility pairs are from the blue line where the sum of the subjects' payoffs is constant. However CI fails to capture *equitability* in the achieved outcomes. Compare for instance a situation where both subjects have preferences (301,299) with a situation where both subjects have preferences (599,1). Both situations have the same index (CI=1) however, the conflict among subjects differs. In the first case any subject is almost indifferent between winning any of the two issues (and losing the remaining one). Instead, in the second case both subjects have a strong preference to win the first issue. This simple example highlights the fact that Axelrod's index of conflict captures the possibilities of trade in a 2-player game but remains silent about the inequality among players.

3 Experimental design

We run a total of 19 sessions with 16 to 20 subjects in each session. In total 356 subjects participate. Students are recruited through the online recruitment system ORSEE (Greiner, 2004) and the experiment takes place on networked personal computers in the LEEX at Universitat Pompeu Fabra between April 2006 and October 2009. The experiment is programmed and conducted with the software z-Tree (Fischbacher, 2007). The data and programme code for the experiment are available upon request.

The same procedure is used in all sessions. Instructions (see Appendix) are read aloud and questions answered in private. Students are asked to answer a questionnaire to check their full understanding of the experimental design (if any of their answers are wrong the experimenter refers privately to the section of the instructions where the correct answer is provided). Students are isolated and can only communicate through the computer terminals in the negotiation treatments (this communication is free through chat boxes but students cannot identify themselves). At each period subjects are randomly matched into groups of two.[4] The table below summarises all our sessions.

Mechanism	Issues	No of votes	Sessions	# Independent Groups	Subjects	Periods	Time Constraint
SM	2	6	3	9	18	50 (25)*	-
SM	3	6	3	9	18	50 (18)*	-
SM	6	6	3	9	18	50 (10)*	-
Neg	2	6	2	3	20 (16)†	25	3 minutes
Neg	3	6	4	5	20	18	4 minutes
Neg	6	6	4	5	20 (18)†	10	8 minutes

Table 1: Details of all our experimental sessions
† in two of our sessions not all recruited subjects showed up
* we restrict our analysis to sessions of equal length (per number of issues)

Preferences are induced by assigning a valuation in terms of euro cents to each of the issues. Valuations are drawn from a uniform distribution of vectors with elements being positive multiples of 50; no issue is valued zero, and the valuations in each vector sum to 600.[5] The purpose of the constant total valuation is twofold. Firstly, it ensures comparability across games and avoids framing effects.[6] Secondly, with normalised preferences all subjects are weighed equally when we calculate our efficient utilitarian outcome. When computing the Conflict of Interest in each of our matched pairs we assume $\overline{\pi} = 600$ and $\underline{\pi} = 0$.

[4] We partition the subjects into three sets of six players (or two set of ten players) so as to obtain three (two) independent observations. We have analysed each observation separately and we see no remarkable difference between them.
[5] For example (300,300), (100,500), (500,100) or (550,50) are all equally likely.
[6] Framing effects imply that voters may behave differently when they are assigned payments (1,2) or (200,400). We want to abstract from such framing issues which have been broadly analysed in many different settings -see the seminal reference Kahneman and Tversky (1983).

Each issue can be tied or 'won' by either of the matched subjects. In our experimental sessions we avoid any reference to the issue being approved or dismissed because we want both matched subjects to be in a symmetrical situation and we fear that labelling the outcome of each issue in terms of approval or dismissal may have an effect. At this point it is worth mentioning that various studies show that negotiations usually reach a more efficient allocation when subjects bargain over abstract situations (see for example Hyder *et al*, 2000). In future research it will be interesting to analyse the relative performance of MIPM and unconstrained negotiation in specific bargaining situations (e.g. divorce settlements, ethical issues, industrial disputes, legislative committees, etc.); however, at the moment this is out of the scope of our paper.

Whenever a subject wins on an issue, he earns his valuation on that issue and his opponent earns nothing; whenever ties occur on an issue, subjects earn half their valuation (note that we are not deciding on that issue with the toss of a fair coin; instead we assign the expected value of such randomisation). The total payoff in a period is the sum of the individual payoffs across the N issues.

In each treatment the same number of issues is presented. In each period, subjects are told their own valuations over the issues, but the valuations of the opponent are never known. In the MIPM sessions, subjects are asked to distribute 6 votes among the issues. In the negotiation sessions, they can freely negotiate through a chat box. This communication is unrestricted with the exception that subjects cannot reveal their identity (in the instructions we state that doing so implies this person being excluded from the lab's recruiting list; in the posterior analysis of the dialogues we do not find anyone breaking this rule). Parallel to their communication, subjects can send binding proposals at any time to the subject they are matched with. These proposals specify the outcome in each of the N issues they are bargaining for. Once an agent accepts his opponent's proposal, the period ends. If no proposal is accepted within the time specified in Table 1, all issues are drawn.[7]

After all subjects have cast their votes or all subjects have reached an agreement (this agreement may be the status quo reached at the end of the negotiating time), the program computes the payoff of each subject and displays: (i) his valuations; (ii) the outcomes; and (iii) his payoff for that period. When subjects used MIPM, the following information was also provided: (iv) their vote; and (v) their opponent's vote. The final payment of the session is computed by adding the payoff obtained in three (randomly selected) periods and a show up fee of 3 euros; in the case of negotiation with 6 issues we selected four periods instead of three. At the end of each session participants are asked to fill in a questionnaire on the computer and are given their final payment

[7] Carnevale and Lawler (1987) claim that most negotiations occur under some form of time pressure. Besides it is not feasible to run a laboratory experiment without such constraints as the possibility of gridlock may freeze the whole experiment indefinitely. Yukl et al (1976) and Carnevale and Lawlwer(1986) show that early deadlines can affect negatively the payoff of integrative negotiations. We try avoiding such effect by running a pilot experiment and implementing a time constraint above the maximum time subjects declared optimal.

in private. Session length, including waiting time and payment, is around an hour and a half. The average payment is 14.97 €.

In table 1 above we see that the sessions with MIPM consist of many more periods than the negotiation sessions. The number of periods was determined so that each session approximately took an hour and a half. When parties negotiated, they took much longer to reach a decision so we reduced the number of periods. In the present paper we only look at the initial periods of MIPM sessions so that we can compare the use of different mechanisms while keeping constant the experience of our subjects (i.e. we only look at the first 25, 18 and 10 periods in the 2, 3 and 6 issues sessions, respectively).[8]

It is often mentioned that adding more dimensions to a negotiation should ease the reach of an agreement (see Thomson, 2001). The reason behind this idea is fairly intuitive: enabling more dimensions allows more trade-offs thus there are more gains from trade (i.e. there are more outcomes that Pareto dominate the status quo). Our conflict of interest precisely captures this idea. We have computed the index in all the situations we generated in the lab and see that the average CI decreases with the number of issues (i.e. the more issues the less conflict or the more gains of trade).[9]

4 Experimental Results

4.1 Aggregated results

Allowing negotiating parties settle their dispute is a difficult task. Inefficiencies arise because parties do not extract possible gains from their different attitudes to risk, patience or relative intensities across different policy dimensions. Strict Pareto improvements fail to realise due to the strategic use of the private information each party has about his own preferences. In this paper, we focus on the role of differing relative intensities among the various decisions that need to be taken.

We want to see how MIPM compares to the way parties usually resolve their disputes, by unconstrained negotiation. We first look at the average payoff obtained by our subjects. Given that monetary transfers are not possible, average payoff might seem meaningless. However, because preferences are normalised, our efficiency requirement can be interpreted as the measure agents would use at a constitutional stage. It corresponds to an ex-ante evaluation where all possibilities are equally weighed when preferences are not yet known.

[8] An extensive analysis of the MIPM sessions can be found in Hortala-Vallve and Llorente-Saguer (2009).
[9] In the appendix (section A1) we report the summary statistics and depict the frequency and cumulative distribution of CI in the induced games.

We also compare both mechanisms in terms of the percentage of times they achieve a Pareto optimal allocation. We are interested in reporting both measures because by only reporting one measure we lose important information. On the one hand we want to know whether subjects could jointly benefit by reaching a different outcome (Pareto optimality), and on the other hand, we want to know how far subjects are from the outcome that would maximise their joint utility. Note that there could be scope for improvement for both subjects but their joint payoff could be marginally close to the one that maximises their joint utility; or alternatively, there could be a situation where they could not jointly improve, but their joint payoff could be much smaller than the efficient one.

The status quo under free negotiation is the one where each issue is decided with the toss of a fair coin. In Figure 1, the outcome lies on the blue line and precisely any outcome below this line yields an average utility strictly smaller than 300. This outcome can also be interpreted as the point where trade-offs across issues are not exploited. Hereafter we generally refer to this outcome as the *no-trade outcome*. When subjects using MIPM uniformly randomise across all voting profiles they also achieve a payoff of 300 thus replicate the payoff achieved by the no-trade outcome.

		Issues		
		2	**3**	**6**
Negotiation	Mean realized payoff	378 (96%)	376 (93%)	375 (96%)
	Standard deviation of realized payoff	99	76	52
	Mean of max possible payoff	395	403	391
	Status quo payoff	300 (76%)	300 (74%)	300 (77%)
	% Pareto efficient outcomes	96	77	60
	% no-trade outcomes	42	20	7
MIPM	Mean realized payoff	373 (96%)	387 (95%)	383 (97%)
	Standard deviation of realized payoff	110	107	62
	Mean of max possible payoff	388	406	394
	Randomisation payoff	300 (77%)	300 (74%)	300 (76%)
	% Pareto efficient outcomes	93	84	62
	% no-trade outcomes	26	4	0

Table 2: Mean payoff, payoff standard deviation percentage of Pareto efficient outcomes, and percentage of no-trade outcomes achieved by negotiation and MIPM (in brackets, payoff as a percentage of the maximum possible welfare). Variables in grey denote theoretical computations; variables in black denote experimental results.

MIPM does at least as good as negotiation: subjects that use this mechanism reach similar payoff levels to the subjects that freely negotiate. We also report the mean of the maximum payoff that each pair could achieve (see numbers in brackets of actual payoffs as a percentage of the maximum payoff). MIPM does significantly better when subjects negotiate over three or six issues; the test statistics of a Wilcoxon–Mann–Whitney two-

sample rank-sum test are 0.0278 and 0.0529 respectively. Against MIPM we can say that it yields higher variance on the individual payoffs: in the three cases, the variance on the subjects' realised payoffs is higher when subjects used the MIPM than when subjects freely negotiated. This is because when subjects freely negotiate, they know the details of the proposal they are accepting; instead, when subjects use the MIPM they only know their own actions and preferences and (implicitly) accept the allocation that results from comparing his/her distribution of votes to his/her opponents' one. In the latter case there is more uncertainty and this is reflected in the variance of the final payoff.

In Table 2 we also show that our results are robust to considering the alternative efficiency criterion of Pareto efficiency. Once again, our mechanism performs similarly to negotiation. The percentage of Pareto optimal allocations always decreases with the number of issues. This follows from the fact that having more issues implies a larger set of outcomes and thus a higher likelihood of Pareto improvements.

In terms of efficiency MIPM does at least as good as unconstrained negotiation. Additionally we want to measure the cost involved in settling disputes. In our situation this is analogous to analysing the time each pair of subjects need to reach an agreement. Results are summarised in Table 3 below. It shows that MIPM clearly dominates unconstrained negotiation in terms of time. This is in fact an immediate consequence of the design of both mechanisms: MIPM only entails subjects unilaterally deciding the distribution of their votes and avoiding communication. We can see that for any number of issues MIPM used a tenth of the time that is used in unconstrained negotiation. Besides, we can see that average times increase with the number of issues –this is a consequence of the increased complexity of dealing with more issues.[10]

		Issues		
		2	**3**	**6**
Negotiation	Average	86	162	286
	St. Dev.	62	74	144
MIPM	Average	9	16	29
	St. Dev.	10	10	20

Table 3: Average time and standard deviation needed to reach an agreement (in seconds). Recall that free negotiation sessions had a time constraint of 180, 240, 480 seconds in the 2, 3 and 6 issues cases, respectively.

4.2 The relevance of the *Conflict of Interest*

The results in the previous section are supportive of MIPM: it reaches similar levels of welfare than unconstrained negotiation and it does so more swiftly. We now want to understand the source of our results

[10] In the appendix (A3) we report the distribution of negotiation times.

and analyse the performance of each mechanism in different situations: it could be the case that there is a particular subset of observations where one mechanism clearly outperforms the other one, but these differences could cancel out when we take the average. To do so, we use the index CI introduced above in order to classify the different games our subjects play according to the inherent degree of conflict; recall that a game has larger conflict when there are less possibilities of trade and subjects find it difficult to reach an agreement that pleases them both. For instance, a situation where subjects have preferences (50,100,450) and (400,50,150) is diametrically different to a situation where subjects have preferences (450,100,50) and (400,150,50). In the first case, the most preferred decision of each subject does not coincide thus there are gains from trade and the conflict can be resolved easily. Instead, in the second case, both agents equally rank the issues and there is no Pareto improvement with respect to the status quo or no-trade outcome where all issues are tied and both agents received a payoff of 300.

Before we analyse in detail our data in terms of the level of conflict it is worth pointing out that the analysis below refers mainly to the free-negotiation sessions. In the MIPM sessions subjects do not realise the level of conflict inherent in their situation because they cannot communicate, and the level of conflict can only be derived by knowing the combination of both opposing parties' preferences.

4.2.1 *Conflict of Interest* and Payoff

We first analyse the relationship between CI and the realised payoff. We expect this correlation to be fairly high as the CI precisely determines the upper bound of what is achievable: in a low conflict game high joint payoffs are possible, instead in a high conflict game the sum of both players' payoffs cannot be much higher than 600. We report the correlation of CI with individual payoffs and the group payoffs, i.e. the sum of utilities of the two opposing parties.[11]

		Issues		
		2	**3**	**6**
Negotiation	*Ind*	-0.79	-0.62	-0.57
	Group	-0.97	-0.78	-0.79
MIPM	*Ind*	-0.67	-0.53	-0.49
	Group	-0.94	-0.88	-0.86

Table 4: Correlation between the Conflict of Interest (CI) and the individual and group realisedrealized payoffs. and the group-average realised payoffs.

[11] Assuming independence of observations, all these correlations are significant at 1% significance level.

We find a correlation close to minus one between CI and the group payoff. The correlation with individual payoffs can only be smaller because the group payoffs cancel the variation within each matched pair. Recall that individual payoffs display a higher variance with MIPM than with negotiation –this is why we obtain lower correlation with individual payoffs in MIPM than with negotiation.

The case with two issues is especially stark: the conflict of interest and the group payoff are almost perfectly (negative) correlated. This can be explained by the dichotomous nature of the two issues case: opposing parties can equally rank both issues and both prefer to be decisive on the same issue; or opposing parties can rank issues differently and prefer to be decisive on different issues. Note that the first case is close to a constant-sum game and the second, to a coordination game where gains from trade are possible (and easy to realise)

Below we illustrate the previous results. We partition observations in four classes of conflict corresponding to each 25th percentile and classify them as situations with very low conflict (VLC), with low conflict (LC), with high conflict (HC), and with very high conflict (VHC).[12] We observe that the payoff reached by both mechanisms decreases with the level of conflict.

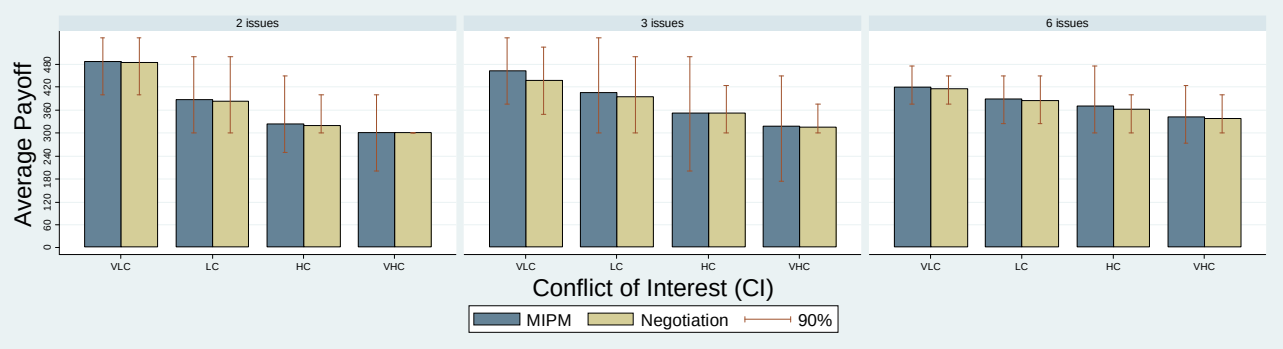

Figure 2: Average payoff at different levels of conflict with 90%-confidence intervals.

Figure 2 shows that the aggregate results presented in Section 3.1 did not hide varying relative performances of the two mechanisms we study: for every level of conflict free negotiation and the MIPM achieve very similar levels of welfare.

4.2.2 Conflict of Interest and Time

[12] We partition our data so that we have classes with the same number of observations (each class has a fourth of observations). The quartiles with 2 issues are 0.5, 0.75, and 0.92; with 3 issues 0.48, 0.62, and 0.74; and, with 6 issues 0.53, 0.60, and 0.68. Our results are robust to considering different partitions (see Appendix A2).

In Section 3 above we have seen that subjects resolving their disputes through unconstrained negotiation take much longer at reaching an agreement. Precisely, the risk of parties never reaching a decision (this is usually referred to as *gridlock* in the political science literature) lead us to introduce a time limit in our negotiation sessions. Subjects had to reach an agreement within 3, 4 and 8 minutes in the 2, 3 and 6 issues sessions, respectively. Failure to do so implied the implementation of the status quo outcome where both no trade occurs and subjects obtain a payoff of 300 each.

The next table captures the relation between the time subjects needed to reach an agreement and the level of conflict, CI. We observe that there is a positive correlation between the time subjects needed to reach an agreement and the level of conflict when subjects freely negotiated. In other words, when the conflict is high a swift agreement is less likely. Instead, when subjects use MIPM they cannot communicate and do not realise the inherent level of conflict, therefore the time spent thinking about the distribution of their votes is unaffected by CI.[13]

	Issues		
	2	**3**	**6**
Negotiation	0.44	0.37	0.30
MIPM	0.01	0.01	-0.03

Table 5: Correlation between the Conflict of Interest (CI) and the time subjects needed to reach an agreement.

Figure 2 below illustrates the table above using four classes of conflict corresponding to each 25th percentile for each number of issues separately. We see that the time parties spend negotiating increases with the conflict of interest. When CI is low there are plenty of gains from trade and agents reach decisions fast. Instead, when CI is high any negotiating party may try to reach an agreement that only benefits himself, tensions among parties may escalate and only with time parties realize that there is no outcome that is Pareto superior to the status quo outcome. Results in Figure 2 are robust to only considering negotiation situations that reach an agreement before the deadline.[14]

[13] Assuming independence of observations, these correlations are significant at 1% significance level in the case of negotiation and not significant in the case of MIPM.
[14] Average time only decreases a 7.1% when we consider situations where status quo is not reached.

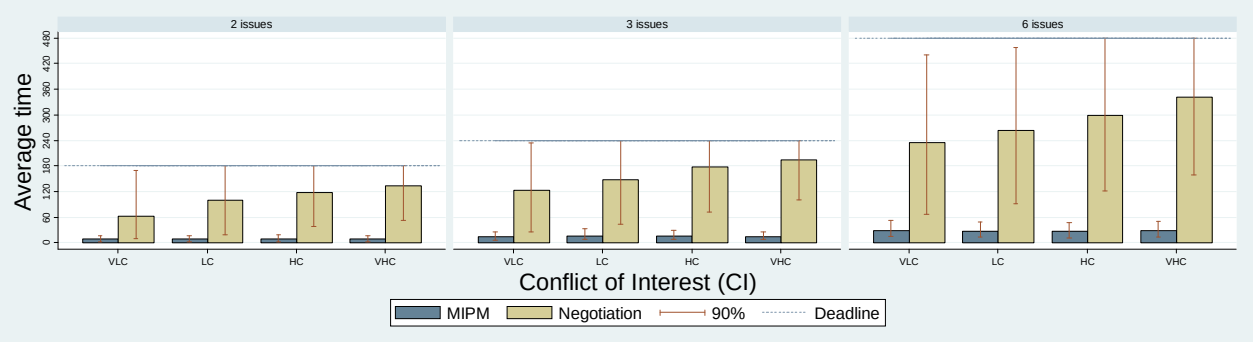

Figure 3: Average time at different levels of conflict with 90%-confidence intervals. We also show the time constraints of 3, 4 and 8 minutes, for the cases with 2, 3, and 6 issues, respectively.

4.2.3 Conflict of Interest and *no-trade* outcome

The fact that our negotiation sessions had a status quo outcome implies that subjects that are not reaching an agreement may decide to implement the status quo outcome without the need of exhausting all available time. Strategic agents may improve the efficiency of the process by implementing the status quo outcome swiftly when they realise that no other outcome may be agreed. When subjects used the MIPM they never reached the no-trade outcome in the six issues case and only a 4% of the observations in the three issues case. Instead, in the two issues case they reached it a 26% of the time (and in 96.6% of these cases both subjects equally ranked the issues).

Table 4 below reports the percentage of cases where the no trade outcome is reached when subjects freely negotiated (we also report the cases where parties reach the status quo by exhausting the negotiating time). Along the lines of the above observations, the number of status quo outcomes increases with the level of conflict. Besides, we can see that while keeping the level of conflict fixed, the number of status quo outcomes decreases with the number of issues (with the exception of the very low conflict levels). This is a consequence of the fact that an increase in the number of issues expands the set of outcomes, thus it becomes more likely that subjects agree on an outcome different than the status quo.

	Conflict of interest			
	VLow	Low	High	VHigh
2 issues	0 (0)	11 (5)	72 (21)	95 (34)
3 issues	8(6)	9 (8)	20 (19)	45 (37)
6 issues	1(0)	3 (3)	11(10)	13 (13)

Table 6: Percentage of times parties reach the status quo outcome in free negotiation; in brackets we report the percentage of times parties reach the status quo outcome by exhausting the negotiating time.

The analysis from the previous table needs to be complemented by the welfare consequences of reaching the status quo outcome. It could well be the case that subjects reach the status quo and that this outcome is Pareto optimal (e.g. opposing subjects have preferences (350,250) and (550,50)); or that the outcome that maximises the sum of utilities yields a similar payoff to the status quo (e.g. when opposing subjects have preferences (250,200,150) and (200,150,200) the average of the maximum possible payoff is 325 –only 25 units above the status quo payoff). Tables 7 and 8 report on this.

	Conflict of interest			
	VLow	Low	High	VHigh
2 issues	.	68	92	96
3 issues	0	0	0	25
6 issues	0	0	0	0

Table 7: Percentage of times of Pareto efficient outcomes when parties reach the status quo outcome in free negotiation.

We can see that the likelihood that the status quo is efficient (when subjects reach such outcome) increases with the level of conflict, specially with 2 issues. With six issues the no-trade outcome can hardly ever be Pareto efficient and it is indeed the case that whenever our subjects reached that outcome there were possibilities of trade.

	Conflict of interest			
	VLow	Low	High	VHigh
2 issues	.	392 (77%)	347 (86%)	319 (94%)
3 issues	476 (63%)	416 (72%)	380 (79%)	338 (89%)
6 issues	425 (71%)	400 (75%)	376 (80%)	346 (87%)

Table 8: Mean maximum possible payoff in the situations where parties reach the status quo outcome in free negotiation; in parenthesis the payoff subjects achieved by implementing the status quo (300) as a percentage of the maximum payoff.

Similar to the results on Pareto efficiency, we realise that the utilitarian costs of reaching the status quo decrease with the level of conflict. In table 5 above we saw that the likelihood of reaching the status quo increases with the level of conflict; however, table 8 shows that the costs in terms of payoff diminish as these events become more likely (i.e. as we increase the level of conflict). Comparing the results in table 8 with the initial average results in table 2, we can see that reaching the status quo always yields an average payoff (as a percentage of the maximum payoff) smaller than the overall average payoff (as a percentage of the maximum payoff). In other words, reaching the status quo payoff has its costs.

Finally, it is worth noting that we do not observe strong deadline effects where subjects use the time deadline strategically to forge better agreements.[15] Agreements are not concentrated at the end of the negotiating period and happen throughout. Moreover, the time when the agreement is reached does not affect the average payoff reached by our subjects.

4.2.4 Can CI explain the differences between both mechanisms?

In summary, we have seen that regardless the number of issues, an increase in conflict has three consequences for parties that freely negotiate: (1) decreases overall payoff, (2) increases the time needed to reach an agreement, and (3) increases the likelihood of gridlock (not reaching a decision and the status quo outcome being implemented). When conflicting parties use MIPM only the first aspect applies.

The main source of inefficiency when parties negotiate through unconstrained negotiation comes from situations where there is high conflict and parties are not able to Pareto improve with respect to the status quo allocation (when such Pareto improvements exist). The fact that under those circumstances negotiations end at a gridlock explains why a simple mechanism like the one proposed in this paper can marginally improve upon unconstrained negotiation.

We test this intuition formally. We regress the payoff as a lineal function of the period, a dummy that is equal to one when the mechanism used is negotiation and 0 when they used MIPM (DummyNeg), the conflict of interest and a constant. We want to see whether the differences in payoff reached by each mechanism are statistically significant; we also want to see their temporal evolution. In our estimation we use a Random-effects GLS regression, clustered by independent groups. Table 6 summarises our results.

				excluding negotiating outcomes where parties reached the status quo outcome		
	2 issues	**3 issues**	**6 issues**	**2 issues**	**3 issues**	**6 issues**
DummyNeg	-2.56	-8.34***	-4.6**	5.71***	2.54	-0.69
Period	-0.05	0.4	1.32***	-0.06	0.67***	1.32***
Conflict of Interest	-307.24***	-262.46***	-259.73***	-300.75***	-265.85***	-251.64***
Constant	600.33***	549.49***	533.54***	595.76***	549***	528.63***
Obs.	2248	2406	1320	1870	2110	1264

Table 6: Random effects GLS regression of the payoff as a function of the listed variables. Hubbard-White robust standard errors, clustered by independent groups. ***, **, and *, denote significance at 1%, 5% and 10% levels, respectively.

[15] For an excellent analysis of deadline effects see Roth, Murnighan, and Schoumaker (1988).

The results from Table 6 show that CI is always highly significant and its coefficient is the most relevant: the index is the most determinant element of the payoff reached by our subjects. The comparison between free negotiation and the MIPM is captured by the negative sign of the DummyNeg variable in the first three columns: when subjects negotiate they obtain a lower payoff than when they use the MIPM (the coefficient of this variable is only significant at conventional levels for three and six issues).

The last three columns show that the coefficient on the free negotiation dummy changes its sign when we drop the observations that reach the status quo outcome under unconstrained negotiation. In other words, when we drop the observations where no trade occurs, we can no longer say that unconstrained negotiation performs worst. The coefficient fails to be significant in the three and six issues cases but is significant in the two issues case. With two issues, the positive coefficient (and significantly different than zero) indicates the advantages of communicating when there is low conflict: it allows agents to trade-off their interests but also allows them to avoid Pareto dominated situations when those are easy to identify. In the two issue case, dropping the observations where the status quo is implemented is analogous to dropping those observations where there are no gains from trade (when both subjects equally rank the issues). It follows that the remaining situations have gains from trade and these can be easily identified when subjects communicate. Instead, when implementing a mechanism that avoids communication like MIPM, subjects may not be able to avoid Pareto dominated outcomes.

Overall, we need to take these regressions with caution. On the one hand, we already saw in Section 4.1 that payoff differences when using both mechanisms are only marginally different. On the other hand, in the 3 and 6 issues case, the change in sign in the coefficient of DummyNeg occurs when we drop very few observations (4% in the 6 issues case and a 13% in the 3 issues case)

MIPM avoids the efficiency costs of implementing the status quo when there are high levels of conflict and performs similarly to unconstrained negotiation when low levels of conflict are present. The main limitation lies in the situations where gains from trade can be clearly identified (e.g. 2 issues with opposite ranking of the issues) when free communication avoids the reach of Pareto dominated situations.

5 Conclusion

We have analysed the performance of two alternative mechanisms to resolve disputes in a controlled laboratory experiment. We have seen that MIPM, so far not analysed in the negotiation literature, does overall at least as good as unconstrained negotiation, but allows the reach of an agreement more rapidly (precisely because it avoids communication among conflicting parties). The essence of MIPM is that it allows parties to

unilaterally trade-off their interests across dimensions and strengthens their position on those issues they mostly care about.

There remain many open questions. Of particular interest is to know when different mechanisms should be used. Following our results it seems sensible to assume that alternatives to the usual ways parties negotiate (unconstrained negotiation) are not necessary when the levels of conflict are low. Instead, it is when conflict is high that we need alternative mechanisms that avoid escalating tension among negotiating parties and eventually gridlock. It is precisely in these environments that our mechanism outperforms unconstrained negotiation in terms of payoff and in terms of the time needed to reach an agreement. Still, the answer is not so simple because it does not seem feasible to propose different mechanisms depending on the conflict of interest. Having different mechanisms for different situations may introduce a new conflict: "which mechanism should we use in our particular situation?" In order to avoid this extra level of conflict we may sometimes need to propose a unique negotiating protocol. In this setting we have shown that MIPM dominates unconstrained negotiation.

Finally, we have restricted our attention to unconstrained negotiation through computer terminals in order to avoid the unquantifiable effects of face-to-face interaction. How our results extend to such situations remains an open question. While there is consensus in the literature that negotiation through chat might take more time than face-to-face negotiation (see for instance Purdy et al, 2000) there is no consensus about whether negotiation through chat obtains better or worse outcomes than face-to-face negotiation. Previous authors have shown that written communication (as compared to oral communication) may ease the reach of an agreement (see Croson, 1999). On this line, Carnevale *et al* (1981 and 1986) show that denying visual access to the negotiation partners achieves more integrative results. Instead, Purdy and Balakrishnan (2000) compare negotiated outcome when communication happens face-to-face, through videoconference, through telephone or through computer terminals and find that the latter leads to longer processes and less integrative behaviour.

In the future we plan to code the dialogues that occurred between our subjects and understand whether it is the individual characteristics or simply the interaction of different negotiating protocols that explain the outcomes and time invested in reaching an agreement in unconstrained negotiation. We also plan to test how a combination of MIPM and unconstrained negotiation may improve the final results; inspired by the results in this paper we believe that a mechanism that would allow subjects to freely negotiation using as a status quo outcome of MIPM may exploit the virtues of both mechanism. Specifically, the combination of both mechanisms may extract gains from trade swiftly and may avoid Pareto dominated outcomes.

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Appendix

A1 Distribution of *Conflict of Interest* (CI) in our experimental sessions

	Issues		
	2	**3**	**6**
Mean	0.697	0.610	0.608
St Dev	0.226	0.184	0.187
Min	0.167	0.187	0.347
Max	1	1	1

Table A1: Summary statistics of CI in our experimental sessions by number of issues. We can see that the mean and the dispersion decrease with the number of issues.

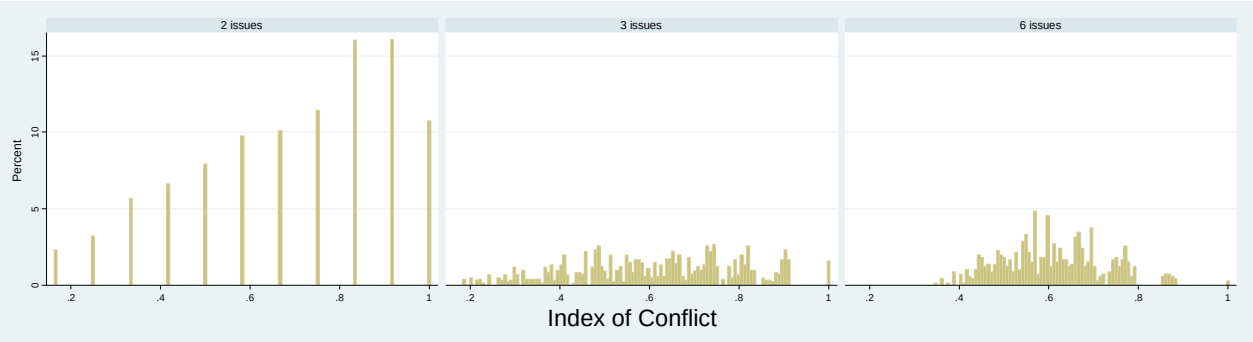


Figure A1: Frequency map of the Conflict of Interest in our experimental sessions by number of issues. We can see how the index concentrates in the middle (decrease in dispersion).

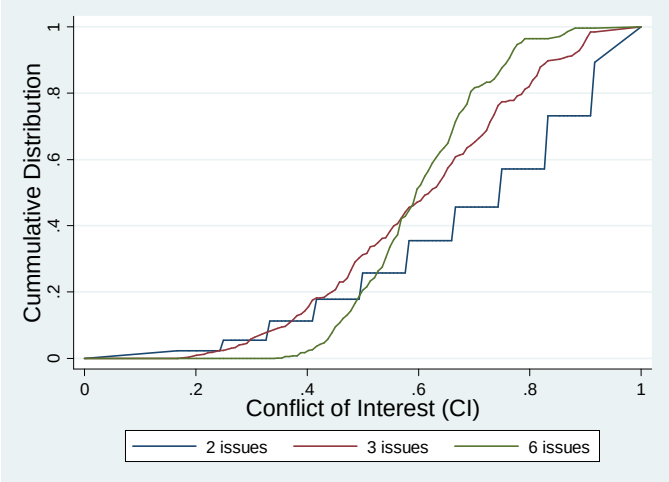


Figure A2: Distribution function of the Conflict of Interest in our experimental sessions by number of issues.

A2 An alternative CI classification

We define three categories as follows: low conflict is when CI is smaller or equal than 0.5, high conflict is when CI is greater than 0.7 and medium conflict are the cases in between. As opposed to the classification we assumed in the main text, we now consider the same threshold for any number of issues so we first need to report on the percentage of observations for each category (table A2). We later graphically show that all results in the text remain unchanged (figures A3 and A4). Finally we also report the analogous table to table 6 with the percentage of times parties reach the status quo (table A3).

	Alternative Conflict of Interest		
	Low	Medium	High
2 issues	26%	20%	54%
3 issues	31%	33%	36%
6 issues	20%	60%	20%

Table A2: Percentage of observations that fit in each category of conflict by number of issues.

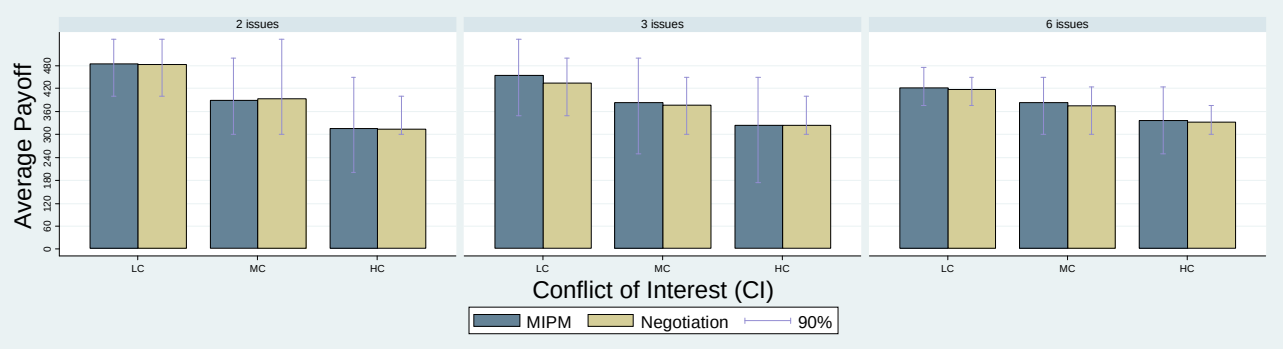


Figure A3: Average payoff at different levels of conflict (alternative measure) with 90%-confidence intervals.

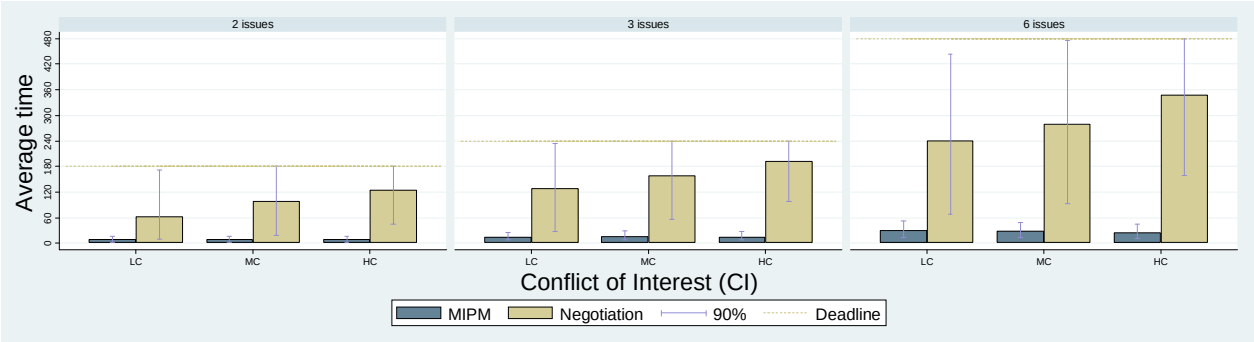


Figure A4: Average time at different levels of conflict (alternative measure) with 90%-confidence intervals. We also show the time constraints of 3, 4 and 8 minutes, for the cases with 2, 3, and 6 issues, respectively.

	Alternative Conflict of interest		
	Low	Medium	High
2 issues	0 (0)	14 (4)	54 (9)
3 issues	4 (3)	9 (7)	28 (20)
6 issues	1 (0)	4 (4)	9 (9)

Table A3: Percentage of times parties reach the status quo outcome in free negotiation; in parenthesis the percentage of times parties reached the status quo outcome by exhausting the negotiating time.

A3 Time needed to reach an agreement with negotiation

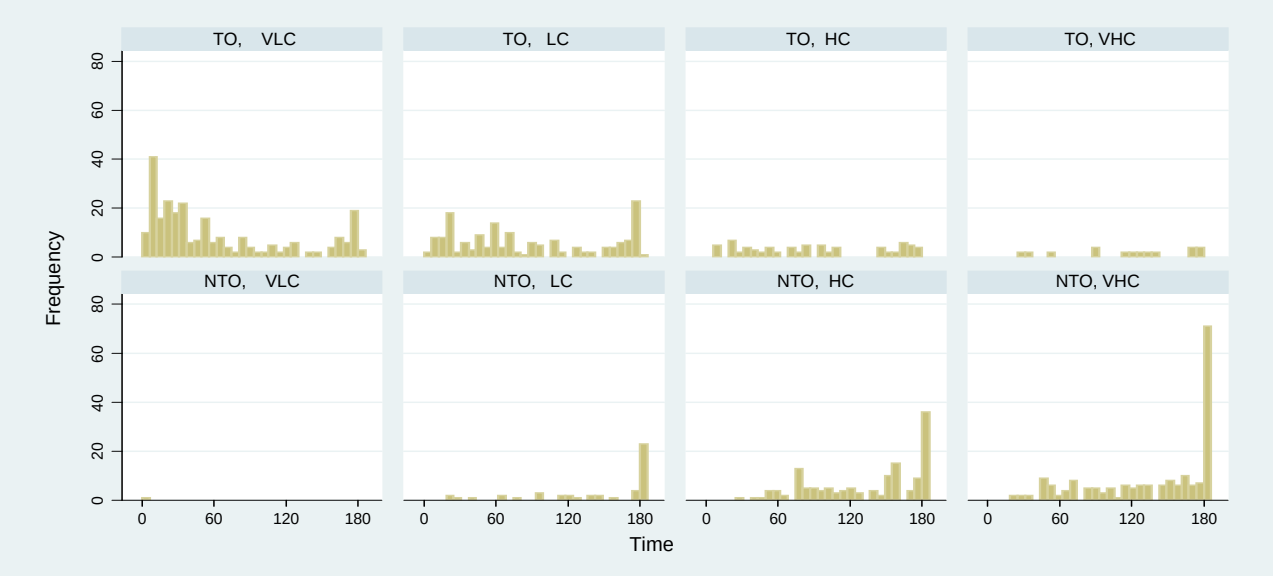


Figure A5: Frequency map of the time needed to reach an agreement when subjects freely negotiated over 2 issues. Above we can see the observations when the outcome is different than the status quo outcome (we call it TO for *trade outcome*) for different levels of conflict: we can see that for lower levels of conflict there is a deadline effect and players (after having tried to reach a more beneficial agreement) realise that there are gains from trade and those need to be agreed upon before the deadline. Below we can see the observations when the outcome coincides with the status quo outcome (we call it NTO for *no-trade outcome*) for different levels of conflict: when there is high conflict we see a big spike, this corresponds to the situations where no agreement was achieved and the status quo was implemented. We can also see that when there is loads of conflict and the no-trade outcome is agreed, there is loads of variance in terms of when is the agreement is reached.

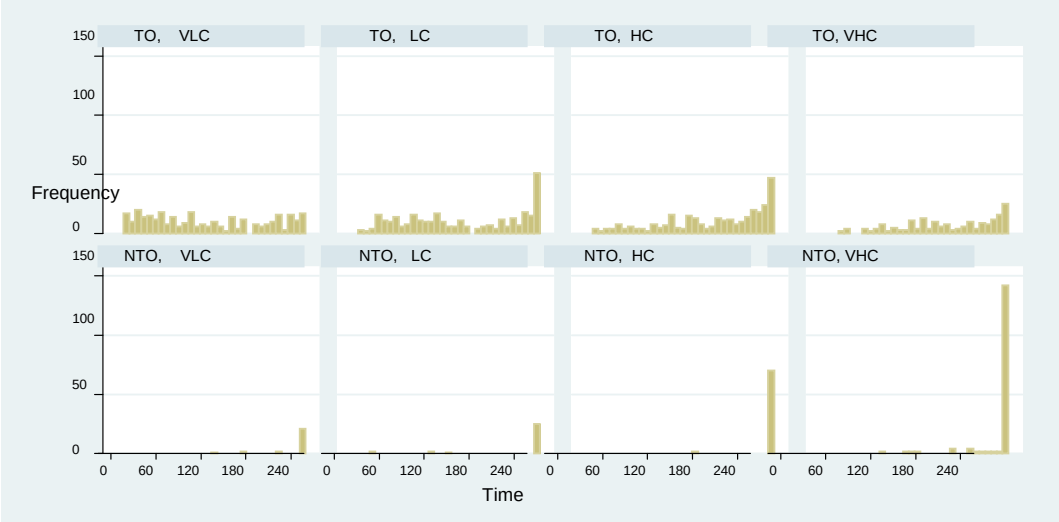


Figure A6: Frequency map of the time needed to reach an agreement when subjects freely negotiated over 3 issues. Above we can see the observations when the outcome is different than the status quo outcome (we call it TO for *trade outcome*) for different levels of conflict: we can see that for higher levels of conflict there is a deadline effect and players (after having tried to reach a more beneficial agreement) realise that there are gains from trade and those need to be agreed upon before the deadline. Below we can see the observations when the outcome coincides with the status quo outcome (we call it NTO for *no-trade outcome*) for different levels of conflict: most realizations now coincide with subjects reaching the deadline.

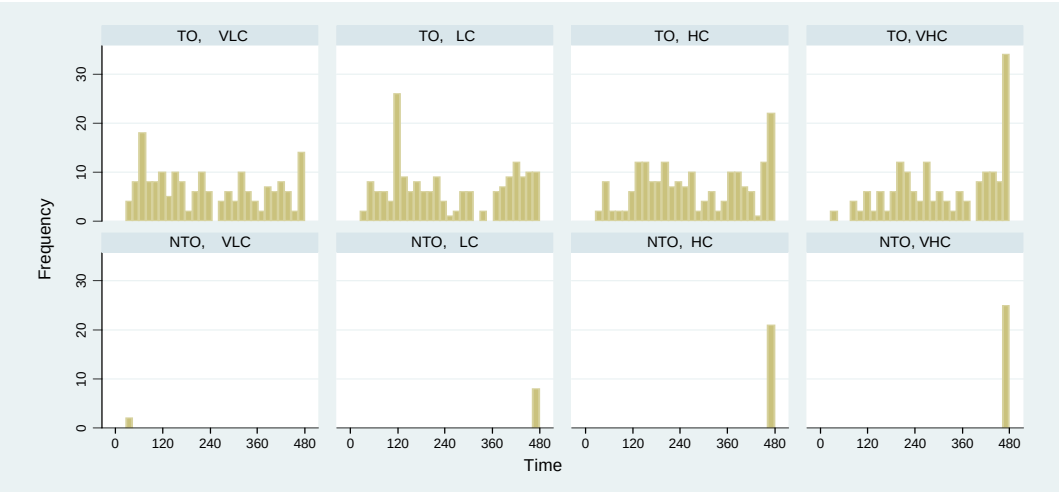


Figure A7: Frequency map of the time needed to reach an agreement when subjects freely negotiated over 6 issues. This case is analogous to the one above (Figure A6, 3 issues).

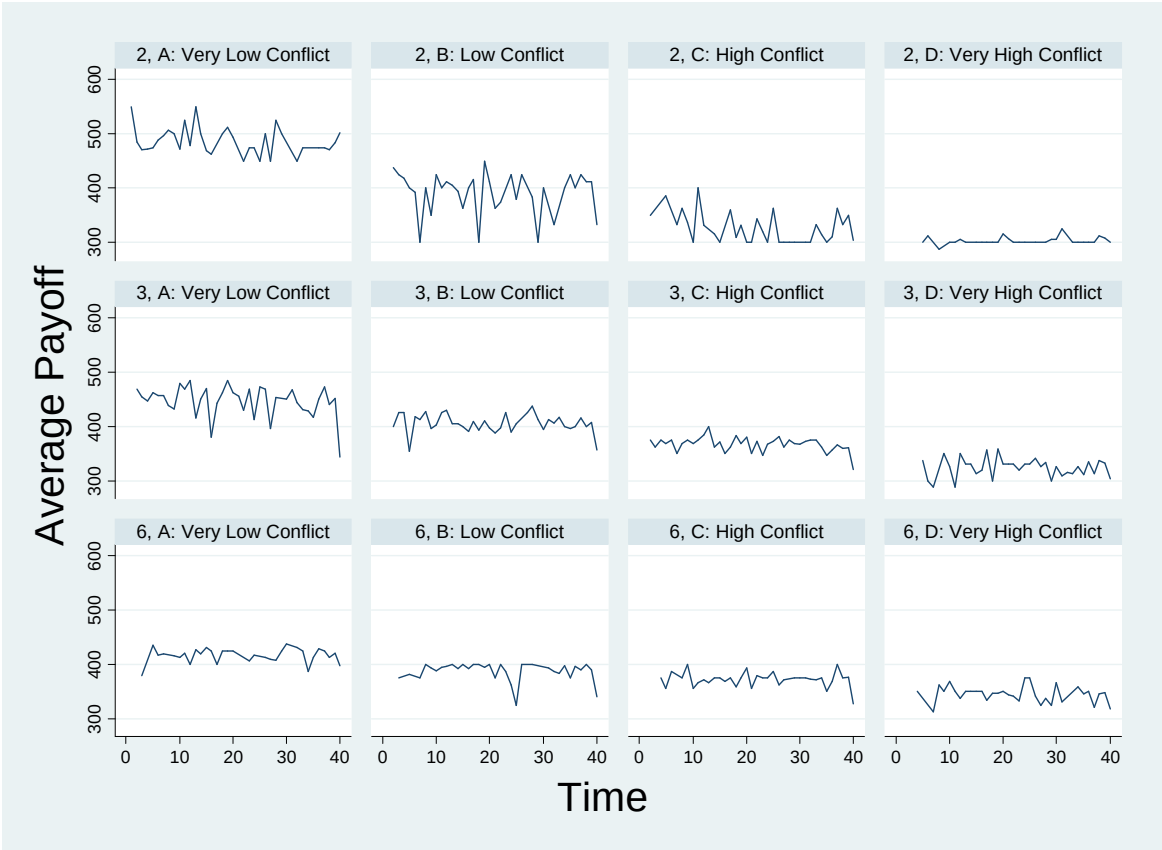


Figure A8: Average payoff at different levels of conflict in terms of the time subjects needed to reach an agreement. We can see that the time when an agreement was reached does not affect the average payoff in any of the cases (2, 3 or 6 issues –i.e. first, second or third row, respectively).

INSTRUCTIONS (Translated from the original Spanish instructions)

We are grateful for your participation and for your contribution to an Economics Department project. The sum of money you will earn during the session will be given privately to you at the end of the experiment. From now on (and until the end of the experiment) you cannot talk to any other participant. If you have a question, please raise your hand and one of the instructors will answer your questions privately. Please do not ask anything aloud!

These experiments consist of 50 periods. The rules are the same for all participants and for all periods. At the beginning of each period you will be randomly assigned to another participant with whom you will interact. None of you will know who the other participant is.

You and the other participant will simultaneously vote over a group of three questions. Each question has three possible results: 1) you win and he loses it; 2) you lose and he wins it; and, finally 3) ties occur. These results will determine the profits that yourself and the other participant will have in each period. Remember that the participant with whom you are interacting in each period is selected randomly in each period.

1. Information at the beginning of each period

At the beginning of each period you will be told your 'valuations' for each issue. You will only know your own valuations. The valuation of each issue specifies how much you earn when you win that issue. These valuations are expressed in terms of Eurocents.

The possible valuations are summarised in the following table. You should consider all possible permutations. That is, looking at the first row, it is for instance possible that the valuations for issues 1, 2 and 3 are 50, 500 and 50 respectively (instead of 500, 50 and 50). As you can see, the valuations are multiples of 50 and add up to 600.

Issue 1	Issue 2	Issue 3
500	50	50
450	100	50
400	150	50
400	100	100
350	200	50
350	150	100
300	250	50
300	200	100
300	150	150
250	250	100
250	200	150
200	200	200

The valuations of each participant have been selected randomly by the computer. All possible combinations of valuations are equally likely. The valuations of each participant need not be equal; what is more, they will usually be different.

2. Voting procedure

In each period you will have six votes that you will have to distribute among the different issues. After doing so you should press the 'OK' key. The participant with whom you are matched at each period has the same number of votes.

3. Voting result

The result on each voting procedure will be resolved by the following rule: if the number of votes you have assigned to an issue is

- … higher than the number of votes of the other participant, you win the issue
- … smaller than the number of votes of the other participant, you lose the issue
- … equal to the number of votes of the other participant, ties occur

For instance, if you vote in the following way:

	Issue 1	Issue 2	Issue 3
Your votes	3	1	2
His votes	0	4	2

You win Issue 1 given that you have assigned more votes (3) than him (0) in that issue; you lose issue 2 given that you have invested less votes (1) than him (4); and you tie issue 3 given that you have both invested the same number of votes (2).

4. Profits in each period

In each period your profits will be equal to the sum of the valuations of all issue you win plus half the valuation of the issue you tie. For instance, if in the previous example your valuations are 350, 100 and 150, according to the assignation of votes in Section 3 your benefits will be: 350 in issue 1, 0 in issue 2 and 75 (half of 150) in issue 3. As you do not know the valuations of the other participants you will not know his /her profits.

5. Information at the end of each period

At the end of each period, as you can see in the previous screenshot, you will receive the following information:

- Your valuations in each issue
- Your votes in each issue
- The votes of the participant you have interacted with
- The issues you win, lose and tie
- Your profits

6. Final payment

At the end of the last period, the computer will randomly select 3 periods and you will earn the sum of the profits on those periods. Additionally you will be paid three euros for having taken part in the experiment.

7. Questionnaire

1. Circle the correct answer. When you have to vote….

   - You know your valuations? YES NO
   - You know the valuations of the participant you are matched with? YES NO
   - Your own valuations and his can be different? YES NO
   - You know who the other participant you are matched with it? YES NO

Imagine you have the following valuations and that you and the participant with whom you are matched vote in the way specified below

	Issue 1	Issue 2	Issue 3
Your valuations	150	250	200
Your votes	1	3	2
His votes	3	1	2

2. Who wins issue 1? YOU HIM TIES
3. Who wins issue 2? YOU HIM TIES
4. Who wins issue 3? YOU HIM TIES

5. How much do you win in issue 1? _____
6. How much do you win in issue 2? _____
7. How much do you win in issue 3? _____

8. Which is your profit in this period? _____

9. How many periods will determine your final payment?

10. Your valuations (50, 500, 50), (500, 50, 50), (200, 200, 200) and (200, 250, 150) have the same probability

    True
    False

11. In all periods you are matched to the same person

    True
    False

12. You know the identity of the participant you are matched with

    True
    False

INSTRUCTIONS (Translated from the original Spanish instructions)

We are grateful for your participation and for your contribution to an Economics Department project. The sum of money you will earn during the session will be given privately to you at the end of the experiment. From now on (and until the end of the experiment) you cannot talk to any other participant. If you have a question, please raise your hand and one of the instructors will answer your questions privately. Please do not ask anything aloud!

These experiments consist of 50 periods. The rules are the same for all participants and for all periods. At the beginning of each period you will be randomly assigned to another participant with whom you will interact. None of you will know who the other participant is.

You and the other participant will decide over a group of three questions. Each question has three possible results: 1) you win and s/he loses it; 2) you lose and s/he wins it; and, finally 3) ties occur. These results will determine the profits that yourself and the other participant will have in each period. Remember that the participant with whom you are interacting in each period is selected randomly in each period.

1. Information at the beginning of each period

At the beginning of each period you will be told your 'valuations' for each issue. You will only know your own valuations. The valuation of each issue specifies how much you earn when you win that issue. These valuations are expressed in terms of cents of Euro.

The possible valuations are summarised in the following table. You should consider all possible permutations. That is, looking at the first row, it is for instance possible that the valuations for issues 1, 2 and 3 are 50, 500 and 50 respectively (instead of 500, 50 and 50). As you can see, the valuations are multiples of 50 and add up to 600.

Issue 1	Issue 2	Issue 3
500	50	50
450	100	50
400	150	50
400	100	100
350	200	50
350	150	100
300	250	50
300	200	100
300	150	150
250	250	100
250	200	150
200	200	200

The valuations of each participant have been selected randomly by the computer. All possible combinations of valuations are equally likely. The valuations of each participant need not be equal; what is more, they will usually be different.

2. Negotiation

In each period you will be able to communicate with the person you are matched with through a chat window. Communication is free except that you are not allowed to identify yourself. If someone identifies himself, he will be excluded from the LeeX participants' list.

At any point during the negotiation, you can send proposals to the person with whom you interact that he should accept or reject. Also, you will have to accept or reject his proposals.

During the negotiation period, the screen will be divided into three parts:

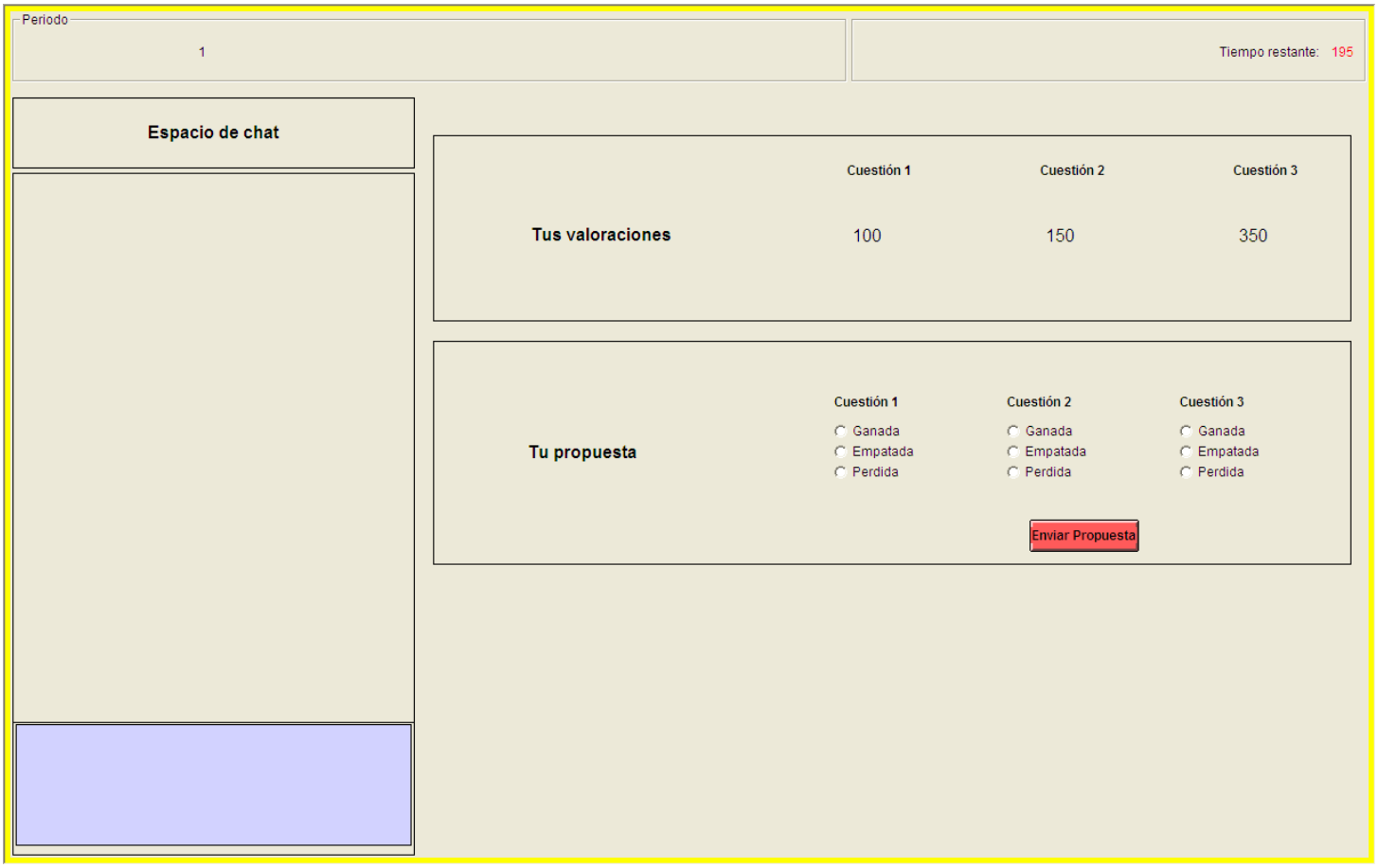
- ***Chat***. In the left part of the screen there's a window in which you will see the messages that you and the person you are matched with have sent from the beginning of the period. In the inferior part of such window you can write messages and send pressing *enter*.

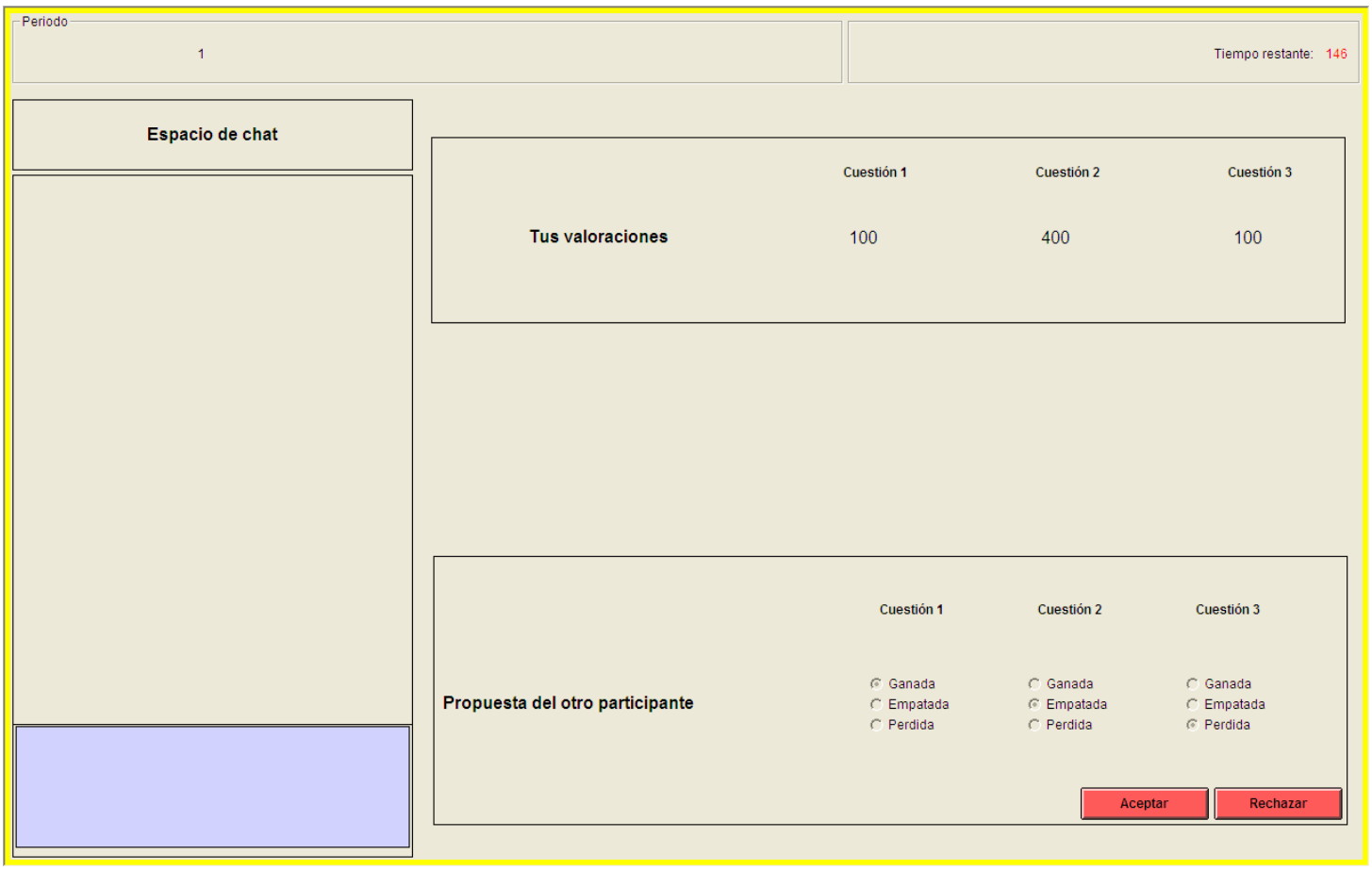
- **Send proposal**. In the upper right part of the screen there's a window through which you can send proposals to the person you are matched with. You have to select whether you win (Won), draw (Drawn) or loose (Lost) each of the issues. Once this is done for all the issues, you will be able to send your proposal to the person you are interacting with.
    - If the other participant rejects the proposal, you will have the opportunity of receiving/sending new proposals.
    - If the other participant accepts the offer, period will be terminated.

- **Accept o reject a proposal**. In the lower right part of the screen there's a third window through which you can accept or reject the proposals that the person with which you interact sends you. This proposal will specify the issues that you win (Won), draw (Drawn) or loose (Lost).
    - If you reject the proposal, you will have the opportunity of receiving/sending new proposals.
    - If you accept the proposal, period will be terminated.

Remember: Both in the proposals that you send and the ones you receive,

- **Won** means that you win and that the person you interact with looses,
- **Drawn** means that you and the person you interact with draw,
- **Lost** means that you loose and that the person you interact with wins.


Periodo
1
Tiempo restante: 195
Espacio de chat
Cuestión 1
Cuestión 2
Cuestión 3
Tus valoraciones
100
150
350
Tu propuesta
Cuestión 1
Cuestión 2
Cuestión 3
Ganada
Empatada
Perdida
Enviar Propuesta


Periodo
1
Tiempo restante: 146
Espacio de chat
Cuestión 1
Cuestión 2
Cuestión 3
Tus valoraciones
100
400
100
Propuesta del otro participante
Cuestión 1
Cuestión 2
Cuestión 3
Ganada
Empatada
Perdida
Aceptar
Rechazar

3. End of the period

The period ends when one of the participants accepts the proposal done by the person he is matched with or alter the deadline of 4 minutes. During the maximum amount of time of 4 minutes, both you and the person with whom you will interact will be able to send proposals and accept or reject them. In the case that none of the participants accepts any proposal before the deadline, the outcome will be a draw in all issues and, hence, your payoff will be 300.

In the upper right side of the screen, you can check the second left to exhaust the time given to negotiate.

4. Profits in each period

In each period your profits will be equal to the sum of the valuations of all issue you win plus half the valuation of the issue you tie. For instance, if in the previous example your valuations are 350, 100 and 150, according to the assignation of votes in Section 3 your benefits will be: 350 in issue 1, 0 in issue 2 and 75 (half of 150) in issue 3.

5. Information at the end of each period

At the end of each period you will receive the following information:

- Your valuations in each issue
- The issues you win, lose and tie
- Your profits

6. Final payment

At the end of the last period, the computer will randomly select 3 periods and you will earn the sum of the profits on those periods. Additionally you will be paid three euros for having taken part in the experiment.

13. Circle the correct answer. When you have to negotiate…

- ¿ You know your valuations? YES NO
- ¿You know the valuations of the participant you are matched with? YES NO
- ¿Your own valuations and his can be different? YES NO
- ¿You know who the other participant you are matched with it? YES NO

14. Imagine you have the following valuations and that you accepted the following offer:

	Issue 1	Issue 2	Issue 3
Your Valuations	150	250	200
	Won	**Won**	Won
Outcome	Drawn	Drawn	**Drawn**
	Lost	Lost	Lost

- How much do you win in issue 1? _____
- How much do you win in issue 2? _____
- How much do you win in issue 3? _____

- Which is your profit in this period? _____

- How many periods will determine your final payment?

- Your valuations (50, 500, 50), (500, 50, 50), (200, 200, 200) and (200, 250, 150) have the same probability.

  □ True
  □ False

- In all periods you are matched to the same person.

  □ True
  □ False

- If after 4 minutes, neither you nor the participant you are matched with accepted any offer, we draw all the issues and each of us gets a payoff of 300.

  □ True
  □ False