(Un)Reliable Concessions in Static and Dynamic Bargaining Experiments*

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A two-persons bargaining problem often consists of initially incompatible demands that can be unilaterally reduced by sequential concessions. In a $2 \times 2 \times 2$–factorial design we distinguish between reliable and unreliable concessions, between a static and dynamic settings and between symmetric and asymmetric initial demands. Whereas *reliable* concessions change the threat point, *unreliable* concessions do not. In the *dynamic* setting each player's concession can be conditional on the previous history of play; in the *static* setting a player's concessions for all bargaining trials are determined at the beginning of the game. In all situations conflict is triggered if neither gives in, or if a maximum number of trials is reached without a feasible agreement. Although our results indicate that conflict is more likely if concessions are reliable, the overall efficiency of both institutions is similar.

Keywords: concession bargaining, behavioral economics,
JEL-classification: C??; C??

1. Introduction

Many negotiations proceed over several rounds, with parties only reluctantly conceding better terms of trade to their counterparts. Think of the rather intricate contract negotiations between a car producer and a job–shop manufacturer of car components, with piecemeal agreements on different aspects of the trade. Or consider the peace talks between two civil war fractions where concessions are made in small increments. In the former example, parties bargain over the division of value added. In the latter, they bargain over their future stakes in a nation's wealth. Due to its complexity, the bargaining process in both cases frequently extends over several rounds, with the relative position of the negotiating partners changing endogenously along the way. The *attainable* total surplus may, however, stay unchanged during the whole negotiation process.

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We model a concession bargaining game in which subjects decide several times whether and how much to concede to the other party. In contrast to the famous Rubinstein (1982) alternating-offers bargaining game, subjects in our game do not take turns, nor does the pie shrink over time. Also more realistically, we assume only a finite number of stages or "bargaining trials."[1]In each of these bargaining trials subjects decide simultaneously whether and how much to concede to their counterpart. Here, a trial is not a particular instant of a bazaar–like bargaining process, but a particular stage in a well structured, discrete-time bargaining process that has a commonly known maximum duration.

What is each party's preferred behavior, both in terms of timing and generosity of concessions? As the final agreement is the result of several partial agreements, an other interesting question arises: should partial agreements be binding, or is it better to implement an 'all-or-nothing' principle? Which mode reduces the likelihood of conflict, and which one induces more efficient outcomes? Another question, hardly addressed in the literature, concerns when parties decide what to do. Do they decide initially about all relevant aspects of their behavior, or do they make up their mind only when a choice is needed?[2] We address this issue with the help of a specific experimental treatment condition, namely a 'static' protocol that elicits history-independent individual demands for the whole duration of the game This representation of the game is contrasted with the more natural 'dynamic' treatment where subjects decide sequentially, being aware of all previous moves.

Concerning conflict we investigate both symmetric and asymmetries situations. According to Fischer et al. (2004) and Hennig-Schmidt and Li (2005), asymmetric conflict payoffs aggravate coordination problems, which results in higher variance of demands and increases considerably the rates of conflict. We control for this possibility by observing each individual's behavior for both symmetric and asymmetric initial conflict payoffs.

Our game resembles the concession model of Zeuthen (1930) which, quite surprisingly, is closely related to the static demand game of Nash (1950) and Nash (1953), as shown by Harsanyi (1977). Similar to Zeuthen we assume that during the negotiation concessions are binding in the sense that they can not be withdrawn while the negotiation continues.[3] Theoretically, therefore, subjects first concede only reluctantly better terms to their opponents, so that final agreements occur only close to the deadline. There may be several justifications for this so called endogenous commitment assumption. It is for instance rather likely that negotiations break up prematurely if one of the parties withdraws previous offers. In real time bargaining

[1]Besides the practical argument regarding the impossibility of credibly implementing an infinite time horizon in the lab (see e.g., the discussion in Selten et al., 1997), one can argue that infinity is a concept with only limited relevance for human behavior. Zeno's paradoxes are exemplary for the conceptual difficulties of infinity. For some interesting discussions of infinity see e.g. Hofstadter (1979) or Gamow (1988). Although the philosophical and mathematical relevance of the concept is unquestionable, for human behavior Keynes' comment (though in a different context) '*In the long run we are all dead*' (Keynes, 1923) is quite appropriate. Furthermore, it is rather customary to set deadlines for negotiations.

[2]More basically, this is related to the fundamental problem of how to represent a game, e.g., in normal form as suggested by von Neumann and Morgenstern (1944), or as a sequential game allowing to formulate notions of sequential rationality.

[3]This assumption is different from the "reliable concessions" vs. "all–or–nothing principle" argument mentioned above. The reliability argument describes the situation in case that the negotiation ends in conflict whereas the other restricts behavior during the negotiation process. Similar to, e.g., Fershtman and Seidmann (1993), who incorporate this - what they call - "endogenous commitment" assumption into the sequential Rubinstein bargaining model, this assumption drives an important theoretical prediction, namely the deadline effect. For a theoretical investigation of incomplete endogenous commitment, see e.g., Cunyat (2004).

experiments a deadline effect is usually observed (for an early review see e.g., Roth et al., 1988). In our setup we contrast reliability with non-reliability of concessions (implementing binding concessions during the negotiation) to test whether and how the deadline effect is affected.

Our computerized laboratory experiment uses a $2 \times 2 \times 2$ factorial design, including both within– and between–subjects comparisons. In Section 2 we present the game, which is then solved in Section 3. Section 4 presents the experimental design of eight laboratory sessions whose results are reported in Section 5. Section 6 concludes.

2. Bargaining through concessions

Two parties, X and Y, bargain about their respective shares of a monetary amount normalized to one, $p = 1$. The bargaining process can extend over at most $T \geq 2$ trials, but it can also be terminated at an earlier trial t^*, with $1 \leq t^* \leq T$. Party j's conflict payoff at the beginning of the game is denoted by c_j^0, whereby $c_X^0, c_Y^0 \geq 0$ and $c_X^0 + c_Y^0 < 1$. Initially, players are assumed to have exogenously fixed demands, defined by $d_i^0 = 1 - c_j^0$ for $i, j = X, Y$, with $i \neq j$.[4] In each bargaining trial t, $1 \leq t \leq t^*$, both players are required to simultaneously submit a new demand, d_i^t, such that subsequent demands cannot be larger than previous ones, i.e., $d_i^t \leq d_i^{t-1}$ for $t = 1, \ldots, t^*$. Thus, in t, player $i = X, Y$ can make a concession of size $d_i^{t-1} - d_i^t \geq 0$.

The number of trials the bargaining process lasts, t^*, is endogenously determined. In particular, if in trial t none of the parties makes a concession (i.e., if $d_X^t + d_Y^t = d_X^{t-1} + d_Y^{t-1}$), the game ends. It also ends if demands become feasible (i.e., if $d_X^t + d_Y^t \leq 1$). Only if at least one player made a concession in trial t, but demands are still unfeasible and the maximal duration T has not been reached, the bargaining process goes on to the next trial. Therefore, the stopping trial t^* is determined by the players' demands in the following way:

$$t^* = \min\{t \mid d_X^t + d_Y^t = d_X^{t-1} + d_Y^{t-1} \ \vee \ d_X^t + d_Y^t = 1 \ \vee \ t = T\}. \tag{1}$$

Payoffs, in turn, depend on the way in which the bargaining process is stopped. If demands in the last trial, t^*, are feasible (i.e., if $d_X^{t^*} + d_Y^{t^*} \leq 1$), parties receive what they demanded. On the other hand, if in t^* demands are unfeasible (i.e., if $d_X^{t^*} + d_Y^{t^*} > 1$), each player i's payoff is defined by the current conflict payoff, $c_i^{t^*}$.

2.1. Reliable vs. unreliable concessions

The value of the conflict payoff at the moment of termination, $c_i^{t^*}$, depends on whether previous concessions were reliable or not. Each *reliable* concession increases the partner's conflict payoff by the amount conceded: This means that in all bargaining trials $t \leq t^*$ player i's conflict payoff is given by $c_i^t = 1 - d_j^{t-1}$. The resulting payoff for $i = X, Y$ $(i \neq j)$ in case of reliable concessions, U_i^r, is therefore

$$U_i^r = \begin{cases} 1 - d_j^{t^*-1} & \text{if } d_i^{t^*} + d_j^{t^*} > 1 \\ d_i^{t^*} & \text{if } d_i^{t^*} + d_j^{t^*} \leq 1. \end{cases} \tag{2}$$

In contrast, if concessions are *unreliable*, only concessions leading to an agreement with feasible final demands (in the sense of $d_X^{t^*} + d_Y^{t^*} \leq 1$) are binding. Here the conflict payoff

[4] Each player's initial conflict payoff can be thought of as a reliable concession already made to him by the other party.

remains fixed at $c_i^t = c_i^0$, $i = X, Y$, in all continuation trials, i.e., in case that the stopping trial t^* has not been reached yet. This implies that concessions are payoff-relevant only insofar as they prevent the bargaining process from ending up in conflict before t^* or T. Thus, the payoff in case of unreliable concessions, U_i^n, equals:

$$U_i^n = \begin{cases} c_i^0 & \text{if } d_i^{t^*} + d_j^{t^*} > 1 \\ d_i^{t^*} & \text{if } d_i^{t^*} + d_j^{t^*} \leq 1. \end{cases} \tag{3}$$

2.2. Bargaining in a static setting

Concession bargaining does not have to be embedded in a dynamic setting with subsequent concessions being conditional on the observed history of play. One can also think of instances of a static version of the game, where parties simultaneously submit a complete vector of demands, $d_i = (d_i^1, \ldots d_i^T)$, such that $d_i^t \leq d_i^{t-1}$ holds. In a sense this represents bargaining through a representative with specific orders or an automat. Here, the payoff relevant demands are $d_X^{t^*}$ and $d_Y^{t^*}$, where t^* is defined as in equation (1). The corresponding payoffs are defined as in equations (2) and (3). This version of the game basically implements a static or normal form bargaining game. By comparing behavior in the two treatments one can disentangle effects of dynamic interaction.

3. Solution

To solve both the dynamic and the static game we impose rationality in the sense of perfect equilibria (Selten, 1975), which also guarantees sequential rationality in dynamic games (Kreps and Wilson, 1982). As in simple demand games where parties can determine only one demand each (Nash, 1950, 1953) there is a continuum of strict equilibria for the games described above. Therefore, the benchmark solution relies on the (subgame) consistent (see Selten and Güth, 1982) Nash bargaining solution (Nash, 1950, 1953).

Let us first consider the last bargaining trial T (if reached) of the dynamic version of the game with *reliable* concessions. Here, the situation is just as the one solved by Nash, implying an equal split of the surplus:

$$d_i^T = \frac{1}{2} + \frac{d_i^{T-1} - d_j^{T-1}}{2} \quad \text{for } \; i, j = \text{X, Y and } \; i \neq j. \tag{4}$$

Anticipating what the equilibrium demands would be if stage T is reached, we can apply backwards induction to obtain equilibrium strategies in the second to last trial, $T-1$. Each party i's demand in period T, and thus his equilibrium agreement payoff (due to $d_X^T + d_Y^T = 1$) increases with d_i^{T-1} in the case of reliable concessions. This implies that concessions to the other party in stage $T-1$ reduce the own final payoff, provided that stage T is actually reached. Stage $T-1$ is reached if previous demands were not feasible, i.e., $d_X^{T-2} + d_Y^{T-2} > 1$, leaving room for an efficient agreement in stage $T-1$. However, reaching an agreement is not an equilibrium in stage $T-1$, since the best-response function of player $i \neq j$ in that stage, given demands d_i^{T-2} and d_j^{T-2}, is

$$d_i^{T-1} = \begin{cases} d_i^{T-2} & \text{if } d_j^{T-1} < d_j^{T-2} \\ d_i^{T-2} - 2\varepsilon & \text{if } d_j^{T-1} = d_j^{T-2} \end{cases}. \tag{5}$$

where $\varepsilon > 0$ is arbitrarily small.[5] The intersection of the best response functions in this case leads to a coordination game, as represented in table 1, where D corresponds to "no concession" and C means "minimal concession". In the table it is straightforward to see that, if stage $T-1$ is reached, there are two strict Nash equilibria in pure strategies, in which one of the two players, say, i, makes a marginal concession and chooses $d_i^{T-1} = d_i^{T-2} - 2\varepsilon$, while j maintains her previous demand.[6]

Table 1: Coordination game in stage $T-1$

Player X \ Player Y	D	C
D	$1 - d_Y^{T-2}$, $1 - d_X^{T-2}$	$\frac{1}{2} + \frac{d_X^{T-2} - d_j^{T-2}}{2} + \varepsilon$, $\frac{1}{2} + \frac{d_Y^{T-2} - d_X^{T-2}}{2} - \varepsilon$
C	$\frac{1}{2} + \frac{d_X^{T-2} - d_Y^{T-2}}{2} - \varepsilon$, $\frac{1}{2} + \frac{d_Y^{T-2} - d_X^{T-2}}{2} + \varepsilon$	$\frac{1}{2} + \frac{d_X^{T-2} - d_Y^{T-2}}{2}$, $\frac{1}{2} + \frac{d_Y^{T-2} - d_X^{T-2}}{2}$

Applying the same backward-induction logic in order to derive the best response functions in all previous periods, it is straightforward to see that all perfect Nash-equilibrium profiles consist of demand vectors d_X^t and d_Y^t such that, for $t = 1, \ldots, T-1$, $d_X^t + d_Y^t = 2(1 - t\varepsilon)$, whereas at stage T an agreement as in equation (4) is reached. So, for instance, the strategy profiles

$$\begin{aligned} \mathbf{d_X} &= \left(d_X^0,\ d_X^0 - 2\varepsilon,\ \ldots,\ d_X^0 - (T-1)2\varepsilon,\ \frac{1}{2}[1 + d_x^0 - d_Y^0 - (T-1)2\varepsilon]\right) \\ \text{and } \mathbf{d_Y} &= \left(d_Y^0,\ d_Y^0,\ \ldots,\ d_Y^0,\ \frac{1}{2}[1 + d_Y^0 - d_X^0 + (T-1)2\varepsilon]\right) \end{aligned}$$

constitute an equilibrium in which only player X concedes. In total, there are 2^{T-1} equilibria in pure strategies, all of them characterized by only one player making a minimal concession at a time.

On the other hand, if concessions are *unreliable*, then the conflict payoffs $c_i^t = c_i^0$, $i = X, Y$, are independent of previous demands. Thus, any play satisfying

$$d_i^{t^*} = \frac{1}{2} + \frac{c_i^0 - c_j^0}{2} \quad \text{and} \quad d_i^t + d_j^t < d_i^{t-1} + d_j^{t-1} \quad \forall t \leq t^* \tag{6}$$

is an equilibrium play. Therefore, unreliable concessions lead to an equal split of the total surplus in equilibrium. Moreover, perfectness considerations (Selten, 1975) suggest that both parties should wait until the last round (i.e. $t^* = T$) before conceding the solution payoff. The reason is that, by making at least minimal concessions of the form $d_i^t = (d_i^{t-1} - 2\varepsilon)$, a player

[5] The amount $2\varepsilon > 0$ can be thought of as the minimum concession a player can make instead of making no concession at all. Note, however, that the border case $\varepsilon = 0$ must remain excluded from (5) in order to guarantee the existence of an equilibrium in pure strategies.

[6] The corresponding equilibrium in mixed strategies is such that each player maintains her demand unchanged with probability $q^{T-1} = 2\varepsilon / \left(d_i^{T-2} + d_j^{T-2} - 1\right)$. This means the probability of not making any concession in period $T-1$ increases with the minimal amount allowed as a concession, 2ε, and decreases with the size of the demands in the previous period. In deriving the benchmark solution of the game, however, we focus on pure strategy equilibria.

guarantees that the game does not end prematurely, while she might increase her payoff[7] if the other party makes unintended large concessions in periods $t < T$ leading to $d_i^t + d_j^t \leq 1$.

Thus the solution for the static game is the same as in the dynamic setup. In particular, a static equilibrium for the case of reliable concessions is any demand vector such that, for $t = 1, \ldots, T-1$, only one party, say, i, makes a minimal concession, setting $d_i^t = d_i^{t-1} - 2\varepsilon$, whereas player $j \neq i$ chooses $d_j^t = d_j^{t-1}$. By such demands d_X^t and d_Y^t players prevent early trials $t = 1, \ldots, T-1$ to be decisive (except by mistakes), so that the same set of pure-strategy equilibria results as for the dynamic game.

4. Experimental design

Our $2 \times 2 \times 2$ factorial design relies on the following treatments and conditions: Treatment '*protocol*' with conditions '*dynamic*' (DYN=1) and '*static*' (DYN=0), treatment '*reliability*' with conditions '*reliable*' (REL=1) and '*unreliable*' (REL=0), and treatment '*initial conflict*' with conditions '*symmetric*' (SYM=1) and '*asymmetric*' (SYM=0) (see table 2, which also reveals how the treatments were implemented.) 'Between subjects' in treatment DYN means that each subject only confronts one of the two conditions, whereas 'within subjects' in treatments REL and SYM means that every subject confronts both treatment conditions consecutively.

Table 2: Treatments, conditions and method of implementation

Treatment	*Implementation*	*Conditions*	*Symbol*
Protocol	Between subjects	Dynamic	DYN = 1
		Static	DYN = 0
Reliability	Within subjects	Reliable	REL = 1
		Unreliable	REL = 0
Initial conflict	Within subjects	Symmetric	SYM = 1
		Asymmetric	SYM = 0

The procedure is illustrated by the example in table 3. Each of the 8 sessions consisted of two matching groups with 8 subjects each, and employed either the 'dynamic' or the 'static' protocol only.[8] Subjects played 8 rounds divided into two blocks of 4 rounds. Each of these two blocks was proceeded by its own set of instructions and employed a different reliability condition. In each session one matching group first played four rounds with REL=0 followed by rounds 5 to 8 with REL=1, whereas the other matching group confronted the two reliability conditions in the reversed order. Within a block of four rounds, subjects interacted in a stranger design, i.e., subjects did not confront the same partner twice. In rounds 5 to 8 the matching of rounds 1 to 4 was repeated (without informing subjects about this).[9]

[7] Note that a concession can not be withdrawn.

[8] In what follows, each matching group is identified by a unique label of the form $s.m$, where $s = 1, \ldots, 8$ denotes the session and $m = 1, 2$ the matching group in that session.

[9] The instructions only mentioned that "*In every round one participant A interacts with one participant B. The combination of participants thereby changes every round.*" See translated instructions in appendix B.

Table 3: Example of a treatment sequences

Round	*REL*	*SYM*
either DYN=0 or DYN=1		
Instructions & Control Questions		
1	0	0
2	0	0
3	0	1
4	0	1
Instructions & Control Questions		
5	1	0
6	1	0
7	1	1
8	1	1

Treatment condition SYM changed every two rounds, i.e., each condition was repeated once before switching to the alternative condition. In this way subjects could get accustomed to the situation, which allowed for a minimum of learning. Since subjects were randomly assigned to the different treatment conditions within and between experimental sessions, we expect that sequence effects (if any) cancel out.

Subjects first received general instructions which were identical for all, and then received the instructions for the first four rounds. These differed according to the DYN and REL conditions. After reading the instructions, subjects had to answer three control questions,[10] designed to test their understanding of the game and, especially, of the payoff rules. Subjects with mistakes were asked to correct them (as often as necessary) until they found all the right answers. Most subjects answered all questions correctly from the very beginning. After playing the first four rounds, subjects received new instructions depending only on the REL condition. Those instructions only included the paragraph which differed from the former instructions and an initial note stating "*The implementation of each round of the second part is identical to that of the first part. Only the payoff rules change partially*". Therefore, excluding the general instructions, six different instructions were distributed: Four different instructions for the first four rounds and two different instructions for the last four rounds.[11] All instructions were kept as similar as possible. After reading the instructions for the last four rounds, subjects again had to answer three control questions. Control questions were identical for all sessions and treatments.

The experimental sessions were conducted in the computer lab of the Max Planck Institute of Economics, in Jena, which features a network of computers installed in visually separated PC booths. The experiment was programmed using Z-tree ("*Zürich Toolbox for Readymade*

[10] Control questions were distributed on paper. Translations of the instructions and control questionnaires are included in the appendix.

[11] In detail: In the first part (DYN=0, REL=0), (DYN=0, REL=1), (DYN=1, REL =0), and (DYN=1, REL=1), and in the second part: one for REL=0, and one for REL=1.

Economic Experiments"; see Fischbacher, 1999) sofware. Subjects were students recruited from various fields of studies at the university of Jena using ORSEE (Greiner, 2004). No subject participated twice or took recently part in a similar bargaining experiment at the Max Planck Institute.

5. Experimental results

In this section we present the data collected in a total of 8 laboratory sessions with 16 participants each. The first four sessions used the dynamic protocol (DYN=1), which provided feedback information between the bargaining trials $t = 1, \ldots, t^*$, whereas the remaining four sessions relied on the static protocol (DYN=0), in which players submitted their vector of demands for all trials with no feedback information between trials. Each session consisted of 8 rounds, whereby each round implemented some version of the concession bargaining game. The maximum number of bargaining trials in any given round was always $T = 5$.

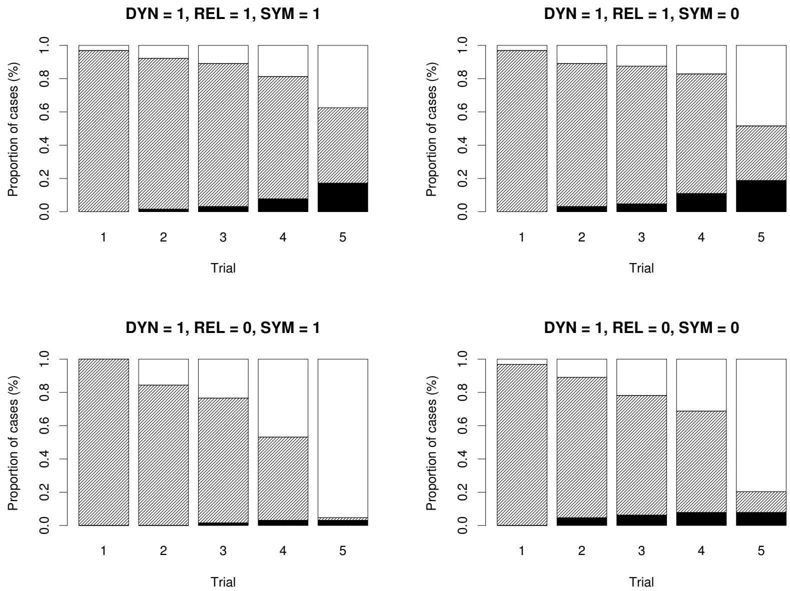
The total available pie was 100 ECU, corresponding to €3.00. After every round subjects were informed about the bargaining outcome, and all rounds were paid at the end of the session. In the symmetric case (SYM=1) the initial demands of all players were set to $d^0 = 80$, whereas in the asymmetric case (SYM=0) one player (labelled high-type) was assigned an initial demand of $d^0_H = 98$ and the other player (labelled low-type) was assigned $d^0_L = 62$. Every time a player was exposed to the asymmetric treatment, he or she was of the same type (i.e., either high or low). The experiments lasted about 70 minutes from the moment of admission till the realization of payments. On average, subjects earned €10.61 (standard deviation = 1.44). Differences in average earnings between sessions 1 to 4 (DYN=1), with €10.63 (1.55), and sessions 5 to 8 (DYN=0), with €10.60 (1.33), were negligible.

5.1. Frequency of conflict and agreement

Concessions directly affect the likelihood of reaching an agreement or ending up in conflict. At the aggregate level, this can be captured in the proportion of negotiations successfully terminated, those that fail, and those proceeding to the next bargaining trial. Figures 1 and 2 depict the evolution of overall rates of conflict and agreement, by trial, for the different treatment constellations. In the static case (DYN=0), the actual matching used in the experiment was adopted to generate Figure 2. Results in this case are, however, independent of matching.

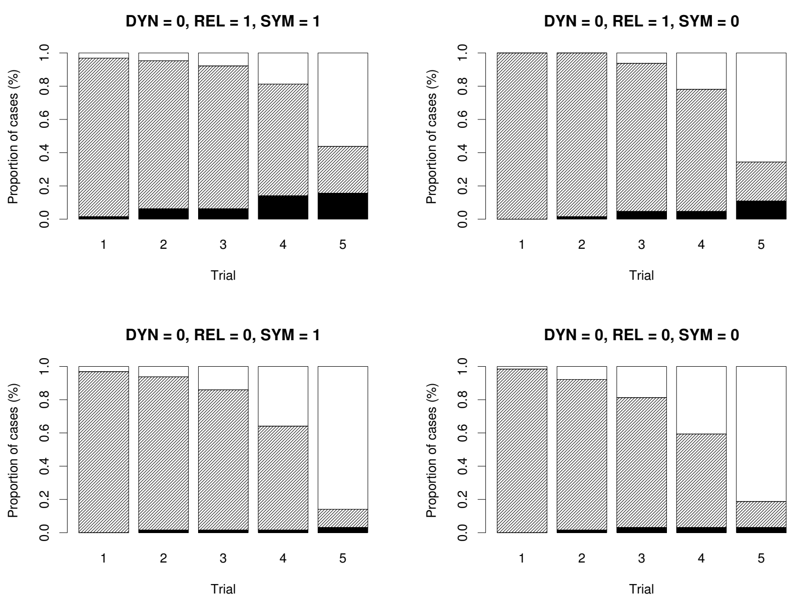
Other things equal, (a)symmetry does not affect the evolution of the rates of agreement and conflict along the five trials of a round.[12] However, there is a marked difference in the proportion of final agreements actually reached under reliability and non-reliability of concessions: whereas in the former case less than a half of the observations end up in agreement, the rate of successful negotiations increases to more than 80% when concessions are *unreliable* or just cheap talk. Appropriate nonparametric tests, testing for marginal treatment effects in the overall rate of agreement of matching groups for each trial, underline this observation. For the REL treatment, the Wilcoxon signed rank test confirms significantly higher rates of agreement under reliable than under unreliable concessions at trial 3 (p-value=0.003), trial 4 (p-value=0.0006), and at the final trial 5 (p-value=0.0004). This confirms our intuition that early reliable concessions reduce the risk of conflict, which may discourage later concessions.

[12] In detail, a Mann Whitney test finds no significant differences in agreement rates for the two DYN conditions in all trials and a Wilcoxon signed rank test finds no significant effects for the two SYM treatment conditions.



NOTE: Each black and white area corresponds to the proportion of cases that up or before the particular trial ended in conflict and agreement, respectively. A shaded area represents continuation to the next period (except for trial 5, where the shaded area represents positive but insufficient concession).

Figure 1: Evolution of conflict and agreement rates in the dynamic protocol.



NOTE: Each black and white area corresponds to the proportion of cases that up or before the particular trial ended in conflict and agreement, respectively. A shaded area represents continuation to the next period (except for trial 5, where the shaded area represents positive but insufficient concession).

Figure 2: Evolution of conflict and agreement rates in the static protocol.

5.2. Efficiency

Efficiency is measured as the proportion of the bargaining surplus finally distributed among the two players. The average efficiency by treatment and matching group observed in the experiment is reported in table 4.

Table 4: Efficiency rates by treatment

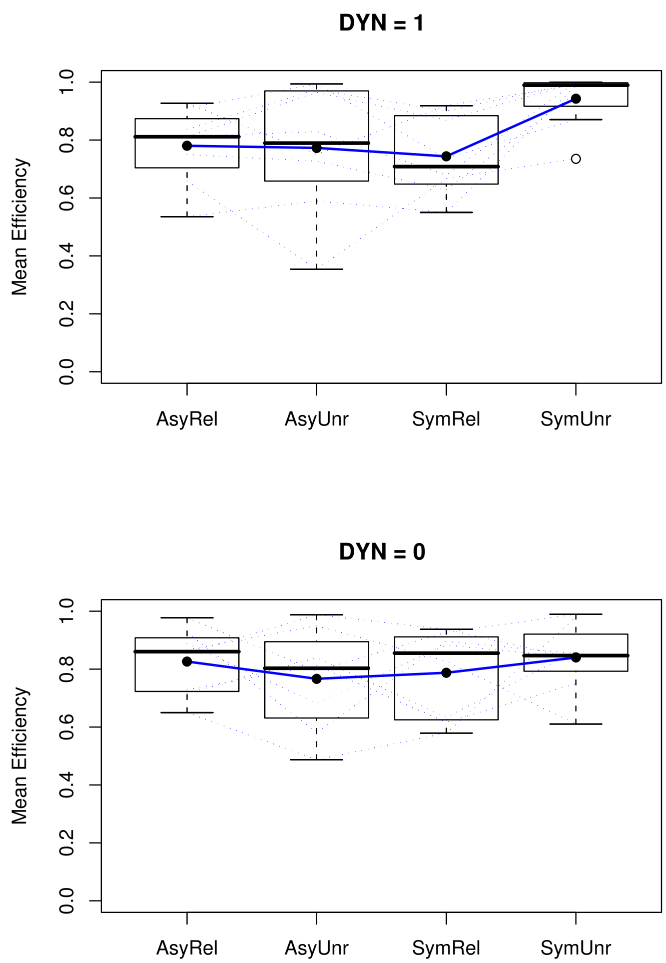
Dynamic Protocol

Matching Group	Asymmetric Reliable	Asymmetric Unreliable	Symmetric Reliable	Symmetric Unreliable
1.1	92.7	75.0	91.9	99.2
1.2	83.8	97.5	90.0	99.8
2.1	53.5	59.0	55.0	98.8
2.2	75.0	72.7	62.9	96.3
3.1	81.0	96.5	86.9	99.8
3.2	81.3	82.9	67.9	100.0
4.1	65.8	35.4	66.7	73.5
4.2	91.0	99.4	73.8	87.1
Mean	78.02	77.29	74.38	94.30
Median	81.15	78.96	70.83	98.96

Static Protocol

Matching Group	Asymmetric Reliable	Asymmetric Unreliable	Symmetric Reliable	Symmetric Unreliable
5.1	89.0	68.1	88.3	84.0
5.2	72.9	81.3	61.7	75.0
6.1	92.7	58.1	89.6	85.4
6.2	65.0	48.8	57.9	97.9
7.1	86.7	95.0	82.7	61.0
7.2	97.7	79.4	92.7	99.0
8.1	71.7	84.0	63.3	86.3
8.2	85.4	98.8	93.8	83.5
Mean	82.63	76.67	78,75	84.01
Median	86.04	80.31	85.52	84.69

Applying non-parametric tests for marginal effects of the three experimental treatments, DYN, REL, and SYM, no systematic differences in efficiency are found. More specifically, the Kolmogorov-Smirnoff test fails to reject the null hypothesis that the distribution of mean efficiency levels among matching groups remains the same when changing a single treatment condition. Nonparametric tests applied separately to the marginal efficiency levels of each treatment also does not reject the null hypothesis that their distributions have the same location parameter.[13] This can also be observed from Figure 3, where the only apparent difference is when symmetric conflict payoffs interact with unreliable concessions.[14] Whereas in other SYM–REL constellations the level of efficiency does not differ between the dynamic and static protocols, conditioning on SYM = 1 and REL = 0 the Wilcoxon rank sum test detects a significant increase in efficiency when the dynamic protocol is used (p-value=0.04042).



Overall mean efficiency rates are represented by the connected black dots
Each box plot has been constructed using the mean efficiency rates whithin individual matching groups.

Figure 3: Distribution of average efficiency rates by treatment

[13] Since the REL and SYM treatments have been applied *within* matching groups, the Wilcoxon rank sum tests for their marginal effects relied on 16 independent observations (paired data points). The Mann-Whitney test for the marginal effect of DYN, in contrast, relied on 8 independent observations in each treatment condition, since this treatment was applied *between* matching groups.

[14] The fact that bargaining under reliable concessions results in conflict more often does not imply that this institutional setting is significantly less efficient. Many of the agreements achieved in case of non-reliability of initial concessions are characterized by excessive concessions in the final trials (anti-conflict). In contrast, ending up in conflict after at least some reliable concessions are made still improves in efficiency compared to the original position of the players.

5.3. Symmetric vs. asymmetric conflict payoffs

The benchmark solution predicts outcomes close to the midpoint of the utility frontier, which allocates equally among both players the (residual) surplus, i.e., the difference between the available pie and the sum of their initial conflict payoffs.[15] The Wilcoxon rank sum test applied to the distribution of the (paired) difference of the logarithm of average demands by each type of player does not reject the null hypothesis of equal demands in each bargaining trial under SYM = 1. This confirms the usual intuition that initial demands tend to be similar *when the conflict payoffs of both players are symmetric*, and –relying on the the mid-point hypothesis– stay close to each other in further bargaining trials. However, under SYM = 0 the ratio of initial high-type and low-type demands is lower than predicted by the benchmark solution, with high-type subjects conceding more than what would be expected from their superior bargaining position. Thus, by gradually getting closer to more symmetric conflict payoffs (in case of reliable concessions), demands of both players split the (entire) surplus equally, contrary to the prediction of the asymmetric case.

More generally, the ratio of the demands made by the two players in any negotiation trial should reflect their relative bargaining power, regardless of the previous history of play.[16] In order to explore this issue, Figures 4 and 5 plot the distribution of relative concessions, i.e., of the ratio between the average high-type concessions and the average of low-type concessions, both by treatment and bargaining trial.[17] According to the mid-point hypothesis, concessions from both types of players should be similar in all trials. However, this is rejected in almost every trial played under the dynamic protocol, and especially in the initial trials.

Concerning the asymmetric case, there is an interesting difference with respect to the reliability condition. In both protocols, dynamic an static, under reliable concessions (REL=1), relative high–type demands decrease with every trial, i.e., on average the high types continually concede better terms to the low types. In the unreliable regime, however, this is only true up to trial 4. Intuitively, under unreliable concessions, high types become more 'stubborn' towards the end.

[15]Here, we neglect minimal concessions made before reaching the final bargaining trial.

[16]This is sometimes referred to as the "mid-point hypothesis," and is equivalent to the prediction that both players should always make similar concessions, regardless of their relative bargaining power.

[17]Averages are taken over all observations corresponding to the same matching group. This means that all graphic comparisons, as well as the corresponding statistical tests, rely on independent observations.

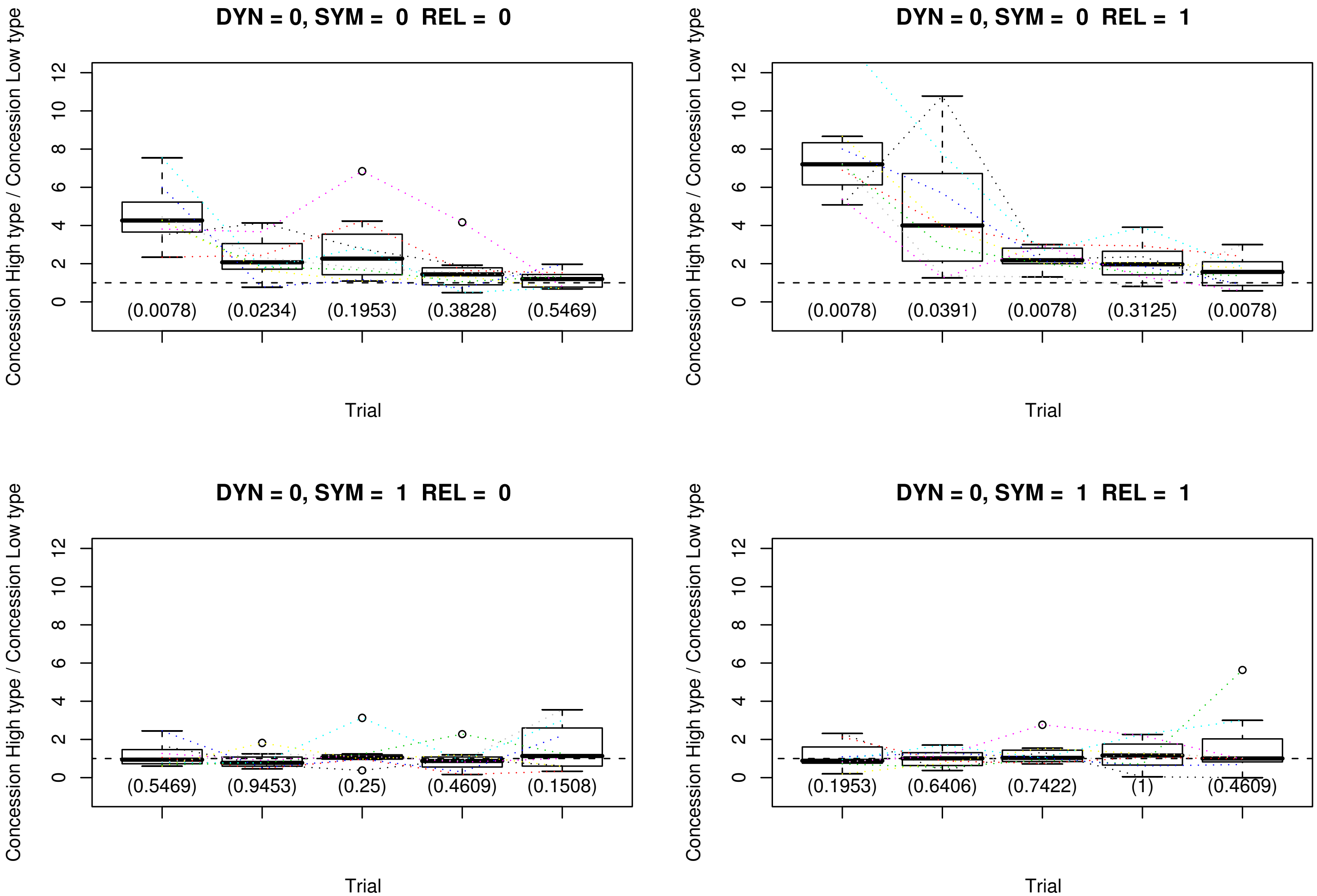


Figure 4: Ratio of concessions by treatment and trial: Dynamic protocol

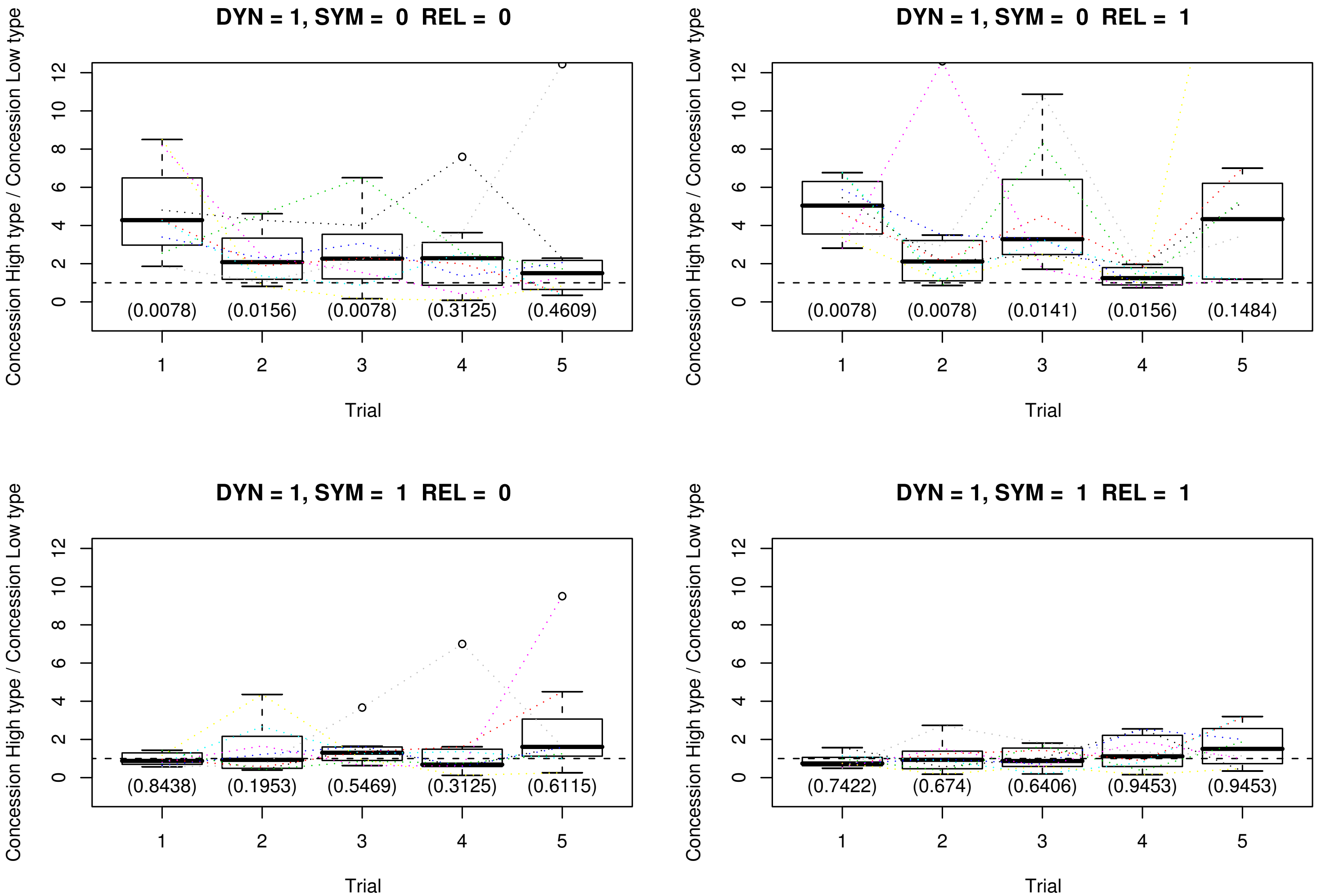


Figure 5: Ratio of concessions by treatment and trial: Static protocol

5.4. Concession behavior

In the static case (DYN = 0), individual concession data are available for all T bargaining trials in all rounds, $T_{i,s} = T$. In the dynamic case (DYN =1), in contrast, $T_{i,s} = t^*_{i,s} \in \{1, \dots, T\}$, with its exact value depending on whether bargaining terminates early or not. Let therefore $y_{i,j;t,s} = d^{t-1,s}_{i,j} - d^{t,s}_{i,j} > 0$ be the amount conceded by individual i when interacting with individual j $(i, j = 1, \dots, n)$ in trial $t = 1, \dots T_{i,s}$ of round $s = 1, \dots, S$ and denote by $\mathbf{x}_{i,j;t,s}$ an r-dimensional vector of explanatory variables, and define the expected concession by $\mu_{i,j;t,s} = \mathsf{E} y_{i,j;t,s}$. Since concessions can only assume nonnegative integer values, we estimate a generalized linear mixed-effects (GLME) Poisson regression[18] with the logarithmic link function

$$\log(\mu_{i,j;t,s}) = \mathbf{x}'_{i,j;t,s}\beta + \mathbf{z}'_{i,j;t,s}\zeta,$$

where a vector of non-nested random effects $\zeta = (\gamma_i, \phi_j, \theta_{i,j})$ is included to control for correlation structures in the data. In detail, γ_i controls for correlation among observations stemming from the same subject. Partner effects ϕ_j control for subject j's ability to elicit concessions from his partners, and pair effects $\theta_{i,j}$ control for effects particular to a pairing. For technical reasons, ϕ_j and $\theta_{i,j}$ only include shift effects. All random effects are assumed to be normally distributed with mean zero and homoscedastic variances. Our estimations therefore rely on the likelihood function

$$\mathcal{L}(\beta; \mathbf{y}) = \int \cdots \int \exp\left\{\sum \left[y_{i,j;t,s} \ln \mu_{i,j;t,s} - \mu_{i,j;t,s} - \ln(y_{i,j;t,s}!)\right]\right\} \mathbf{d}\gamma \; \mathbf{d}\phi \; \mathbf{d}\theta, \tag{7}$$

which is optimized using the penalized quasi likelihood maximization algorithm (see, for instance Breslow and Clayton, 1993).

Concession behavior in the dynamic protocol

A first overview of the main treatment effects in the dynamic protocol is reported in table 5. Here, covariates REL and SYM are dummies indicating the treatment condition of reliable concessions and that of symmetric initial demands. The dummy variable ROLEX identifies subjects with a higher initial demand in the asymmetric (SYM=0) treatment condition. Covariates separated by a colon (e.g. SYM:ROLEX in table 5) indicate the interaction of single covariates. Interaction effects which are not included in the estimation were insignificant and/or did not contribute to the accuracy of the model according to the Schwartz and Akaike information criteria. The significance level of inference tests is set to 1% throughout. The intercept represents the concessions made by player Y in the unreliable concession condition with asymmetric initial demands. Our results confirm that overall concessions are smaller under reliable than under unreliable concessions. Also, concessions tend to be larger in the symmetric case than in the asymmetric one. As the interaction effect REL:SYM proves to be insignificant this is true for both REL conditions. While ROLEX is significant and positive, SYM:ROLEX is negative and both effects offset each other. Therefore, X-types make higher concessions than Y-types only in the asymmetric (SYM=0) treatment condition.[19]

A more elaborate picture of concession behavior is given by the GLME Poisson estimation in table 6. In addition to the variables included in the model above, this introduces variable

[18] In principle, concessions also have an upper bound. However, since subjects always demanded positive amounts $d^t_i > 0$, it is possible to neglect the effect of truncation.

[19] In the symmetric case where roles are merely labels, they do not have any influence on behavior. Also note that there are no role effects concerning treatment REL.

Table 5: Poisson GLMM of individual concessions: Dynamic protocol

covariate	*coefficient*	*Std.Error*	*p-value*
Intercept	1.3102*	0.0755	< 0.001
REL	-0.2109*	0.0517	< 0.001
SYM	0.6772*	0.0879	< 0.001
ROLEX	1.0545*	0.0832	< 0.001
SYM:ROLEX	-1.1043*	0.1106	< 0.001
AIC: 7190	BIC: 7247	logL: -3585	
Included random effects: $\gamma_i^0 + \gamma_i^{REL} REL + \gamma_i^{SYM} SYM + \phi_j + \theta_{i,j}$			

NOTE: Interaction effects were insignificant and did not contribute to the accuracy of the estimation according to the Akaike (AIC) and the Schwartz (BIC) information criteria. Log likelihood of null model: -3915. *: significant (at 1% level).

TRIAL indexing the trial and dummy variables TRIAL1 and TRIAL5 identifying the first and, if reached, fifth trial of a negotiation round. Furthermore, in order to test for reciprocal behavior, the lagged concessions of the partner were included (OTH.C.lag).[20]

While concessions decrease insignificantly with each trial during the entire negotiation round (TRIAL), they are significantly greater at the beginning (TRIAL1) and when approaching the deadline (TRIAL5). The latter effect could be explained by subjects who made rather small concessions before, and who therefore concede more towards the end.

A closer look into the data, plotted in Figures 7 to 14 in the Appendix, reveals that many subjects immediately make high concessions already in the first trial and then either stop conceding or concede only little. Other subjects concede little throughout until the very last trial. Interestingly, this effect of high initial concessions is significantly reduced under reliable concessions (REL:TRIAL) where it is less desirable to find an early agreement. However, effects TRIAL1 and REL:TRIAL1 are still jointly significant. Furthermore, the effect of high initial concessions is considerably amplified under symmetric initial conflict payoffs (SYM:TRIAL1), when there is little ambiguity about what is fair. The interaction effect between the symmetry (SYM) condition and the deadline effect (TRIAL5) is, however, insignificant.

To some small degree subjects display reciprocal behavior.[21] indicated by the small but significantly positive coefficient of OTH.C.lag (larger concessions by partners are reciprocated in the following trial). Most other effects qualify our previous regression results. The average effect of reliability, however, becomes insignificant. The REL effect in table 5 seems due to the differences in early concessions (REL:TRIAL1 in table 6).

Concession behavior in the static protocol

In the static protocol subjects submitted a full demand vector of length 5. Choice vectors from the experiments employing the static protocol were paired with each other, yielding the

[20] Again the model in table 6 represents the one which fits the data best according to the Akaike and Schwartz information criteria. Note that variable TRIAL, though insignificant, needs to remain included, as otherwise the meaning of variables TRIAL5 and TRIAL1 would be corrupted. Furthermore, REL remains in the model due to corresponding interaction effects.

[21] Due to the logarithmic link, it is rather hard to compare marginal effects. However, given average concessions of 6.44, the OTH.C.lag effect is considerably smaller than most treatment effects.

Table 6: Poisson GLMM of individual concessions: Dynamic protocol, full model

covariate	*coefficient*	*Std.Error*	*p-value*
Intercept	1.1922*	0.1587	< 0.001
REL	-0.0547	0.0568	0.336
SYM	0.4415*	0.0784	< 0.001
ROLEX	0.8538*	0.0719	< 0.001
TRIAL	-0.1364	0.0543	0.012
TRIAL1	0.4647*	0.1067	< 0.001
TRIAL5	0.5556*	0.1077	< 0.001
OTH.C.lag	0.0177*	0.0025	< 0.001
SYM:ROLEX	-0.9491*	0.0900	< 0.001
REL:TRIAL1	-0.2711*	0.0819	< 0.001
SYM:TRIAL1	0.4129*	0.0872	< 0.001
AIC: 6665	BIC: 6802	logL: -3309	
Included random effects: $\gamma_i^0 + \gamma_i^{REL} REL + \gamma_i^{SYM} SYM + \gamma_i^{TRIAL} TRIAL + \phi_j + \theta_{i,j}$			

NOTE: Interaction effects which are not included were insignificant and did not contribute to the accuracy of the estimation according to the Akaike (AIC) and Schwartz (BIC) information criteria and the log likelihood. Log likelihood of null model: -3915.

respective outcomes for each possible combination of observed choice vectors. With the matching rules described in Section 4 there are altogether 24^8 possible matchings of subject's choice vectors. To obtain results which do not depend on the particular matching, all estimations were run with 200 different matchings (randomly selected with replacement each time). Using this pseudo-bootstrapping algorithm the results of those estimations were then used to obtain efficient and matching independent coefficients and variances.[22]

Table 7 reports results from a generalized linear Poisson mixed-effects regression of the matched static demand vectors similar to the one reported for DYN=1 in table 5. As in the static protocol no direct interaction takes place, random effects $\phi_j + \theta_{i,j}$ were excluded. Results of the simple model by and large resemble those in the dynamic case. Only the reliability effect appears to be weaker in the static data.

A more detailed picture is given by the full model in table 8. Behavior differs considerably from the dynamic protocol. As subjects can not coordinate it is not surprising that the lagged concessions of the partner are insignificant.[23] Most importantly, however, reliability leads to both, a significant downward shift (REL) and a significant increase in the slope with respect to the trial (REL:TRIAL) with concessions increasing significantly with each trial only under reliable concessions. This makes sense, as, lower first concessions in the REL treatment must be matched by higher later concessions. Again there are significant effects at the first and if reached last trial. In the TRIAL effects there are some interesting differences in behavior

[22] All 200 random matchings used the rules also employed in the experiment. Coefficients and estimations of approximate variance of coefficients were used to create a random normal sample of size $200 \times 64 = 12800$ whose moments were used as efficient estimators of matching independent coefficients.

[23] Due to insignificance variable OTH.C.lag was taken from the estimation.

Table 7: Poisson GLMM of individual concessions: Static protocol

covariate	*coefficient*	*Std.Error*	*p-value*
Intercept	1.273*	0.067	< 0.001
REL	-0.134*	0.047	0.006
SYM	0.672*	0.079	< 0.001
ROLEX	1.075*	0.075	< 0.001
SYM:ROLEX	-1.101*	0.103	< 0.001
AIC: 6861	BIC: 6930	logL: -3418	
Included random effects: $\gamma_i^0 + \gamma_i^{REL} REL + \gamma_i^{SYM} SYM$			

NOTE: Demand vectors were matched in order to obtain 'as–if' dynamic data. A bootstrap method was implemented in order to avoid results based merely on matching of subjects. Interaction effects were insignificant and did not contribute to the accuracy of the estimation according to the Akaike (AIC) and the Schwartz (BIC) information criteria. AIC, BIC and logL are taken from an estimation using the matching implemented in the sessions. *: significant (at 1% level).

between the two roles. Under asymmetry, the high types tend to concede less with each trial (see ROLEX:TRIAL and SYM:ROLEX:TRIAL).[24] The other results of the estimation again confirm our previous conclusions.

5.5. Resulting payoffs

Finally we take a look at treatment effects on the resulting payoffs. Here, it is important to differentiate between the two roles (X or Y). Boxplots in Figure 6 show the distribution of average payoffs per matching group separately for for the two roles and the 3×2 treatment conditions. Although reliable concessions lead to on average smaller payoffs in both roles, this effect is negligible (Wilcoxon rank sum test yields p-value=0.01399 for X and =0.6884 for Y). Symmetry of initial conflict payoffs, however, has a strong impact on payoffs in each role. Whereas the high types, despite conceding more, earn significantly more in the asymmetric condition than in the symmetric (p-value=0.00024), for the low types (Y) the opposite applies (p-value=0.00046).[25]

Has reliability of concessions an effect within one of the symmetry conditions? Using the Wilcoxon rank sum test, no significant differences can be found. Finally, also the protocol of play (DYN) also has no significant[26] effect on payoffs.

6. Conclusions

By our stylized bargaining game resembling Zeuthen's concession model, we tested how behavior reacts to several treatments. Although theoretically concession behavior should, with

[24]As ROLEX:TRIAL and SYM:ROLEX:TRIAL are jointly insignificant, this decrease of concessions by the high type is not present under symmetry.

[25]Both tests: Wilcoxon rank sum test.

[26]Mann Whitney test: p-value=0.1349 for X and p-value=0.4791 for Y.

Table 8: Poisson GLMM of individual concessions: Static protocol, full model

covariate	*coefficient*	*Std.Error*	*p-value*
Intercept	1.015	0.138	< 0.001
REL	-0.288	0.070	< 0.001
SYM	1.375	0.128	< 0.001
ROLEX	1.765	0.120	< 0.001
TRIAL	-0.019	0.046	0.366
TRIAL1	0.533	0.070	< 0.001
TRIAL5	0.544	0.083	< 0.001
SYM:ROLEX	-1.856	0.159	< 0.001
REL:TRIAL	0.080	0.026	0.004
SYM:TRIAL	-0.282	0.044	< 0.001
ROLEX:TRIAL	-0.273	0.041	< 0.001
SYM:ROLEX:TRIAL	0.301	0.058	< 0.001
AIC: 6053	BIC: 6167	logL: -3006	
Included random effects: $\gamma_i^0 + \gamma_i^{REL} REL + \gamma_i^{SYM} SYM + \gamma_i^{TRIAL} TRIAL$			

Note: Demand vectors were matched in order to obtain 'as–if' dynamic data. A bootstrap method was implemented in order to avoid results based merely on matching of subjects. Interaction effects were insignificant and did not contribute to the accuracy of the estimation according to the Akaike (AIC) and the Schwartz (BIC) information criteria. AIC, BIC and logL are taken from an estimation using the matching implemented in the sessions.

only minimal deviations, not dependent of treatments, remarkable differences in behavior are observed (which, however, do not affect efficiency of outcomes).

The main treatment, reliability of concessions, has considerable marginal effects only on the conflict and agreement rates. Reliable concessions increase conflict payoffs, thereby reducing the relative costs of breaking up. This effect is mirrored in higher conflict rates in our experimental data. Since earlier concessions increase conflict payoffs this, however, has no effect on efficiency of outcomes.

Our results concerning differences in behaviour under the two SYM conditions by and large qualify previous experimental observations (see e.g., Fischer et al., 2004; Hennig-Schmidt and Li, 2005). Asymmetry induces higher concessions by those receiving higher conflict payoffs. This increase in high-type concessions is, furthermore, matched by the low–types concessions, who tend to concede less. While the marginal effect of treatment SYM on efficiency is insignificant, the combination of symmetric initial conflict payoffs with unreliable concessions for the dynamic protocol increases efficiency significantly. Obviously, only the combination of the need to find an agreement with symmetry and observability of previous moves triggers behavior which corresponds better than in other situations. Although high types concede more in the asymmetric condition, they nevertheless earn more in the asymmetric than in the symmetric situation.

As expected, concession behavior over time depicts a considerable deadline effect. Most agreements just happen during the final negotiation trial. Contrary to the theoretical predic-

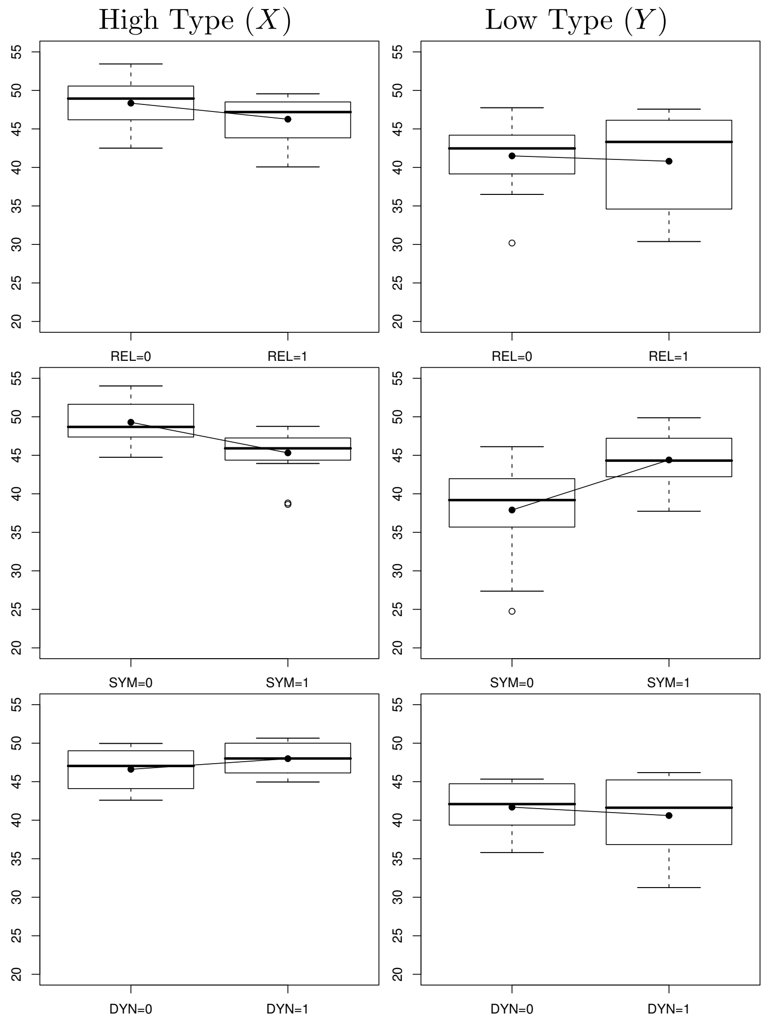


Figure 6: Boxplots of average payoffs of matching groups per role and treatment

tions, however, high initial concessions can be observed, too. As high initial concessions are only independent of treatments SYM and REL in the static protocol, subjects appear to use high initial concessions strategically in the dynamic protocol. Here, early concessions can be observed by the other party. The effect is highest in the symmetric case. Obviously, due to the symmetry, subjects belief that the outcome of the game is obvious and want to prevent the opponent from trying to achieve anything different. A high initial concession strongly signals what one expects to be the outcome and, that one is not accepting any deviation from that outcome. The reduction of high initial concessions in the reliable condition, where they – due to the resulting increase in the opponents conflict payoff – may rather trigger "stubborn" behavior, underlines this interpretation.

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A. Data

B. Translation of instructions

Instructions in the experiment were written in German. The following chapter reproduces a translation into English. Text written in this font marks comments which were not included in the instructions but are important for this chapter. All other emphasizes like, e.g., bold font are taken from the original text.

General instructions were identical for all subjects:

General Instructions

Welcome and thank you very much for participating in this experiment. Please read the following instructions carefully and cease communication with other participants of any kind. If there is something unclear, please don't ask loudly into the room but rather raise your arm and wait for a supervisor to approach you, who will answer your questions. Instructions are identical for all subjects. All decisions will remain anonymous. The experiment consists of 2 parts of four rounds each. You will get separate instructions for each part. In every round you can earn money. How much money you earn depends on your own decisions, decisions of other participants and of chance moves.

In the experiment all amounts will be denominated in "ECU" (*Experimental Currency Unit*). Hereby 100 ECU equals €3. Your entire income at the end of the experiment is the sum of your incomes off all rounds and will be disbursed to you in cash in €.

At the beginning of the experiment a chance move assigns one of two roles – A or B – to you. You will keep your role during the entire session. One half of all participants will decide in role A, the other in role B.

In every round one participant A interacts with one participant B. The combination of participants thereby changes **every round**.

Instructions for rounds 1–4 for static protocol (DYN=0) and unreliable concessions (SYM=0):

Instructions

What is being decided in one round

Two interacting participants of one round (A and B) each can disperse altogether 100 ECU among each other. At the beginning of each round each one is given a starting value f^0 (f_A^0 of A and f_B^0 of B) – the so called "*initial demand*". Each participant is informed about both values. *Initial demands* are incompatible, meaning that both combined exceed the available amount of 100 ECU ($f_A^0 + f_B^0 > 100$).

For the dispersion of the 100 ECU a maximum of five *trials* (t) is given. At each trial t you and the other participant with whom you interact submit a new *demand* simultaneously, without being able to observe the others' action. I.e. in each round you have up to five opportunities to agree upon a division of the 100 ECU among the two of you. In the following the demand of participant A in the t^{th} trial will be denoted f_A^t, and equivalently the demand of B by f_B^t. Two demands are said to be "*compatible*" if the sum is smaller or equal the total available amount of 100 ECU ($f_A^t + f_B^t \leqq 100$).

A concession which was made at an earlier trial can not be withdrawn. I.e. at each trial t, in comparison to your previous demand f^{t-1}, you can only either leave your demand unchanged or reduce it ($f^t \leqq f^{t-1}$). This implies that at the first trial ($t = 1$) you can not submit a demand greater than the initial demand f^0 attributed to you.

How many trials actually are there in each round?

If at all trials prior to the fifth at least one participant reduced his demand but demands were still *incompatible* at the fourth trial, then the round ends with the fifth trial ($t^\star = 5$).

A round ends *before* the fifth trial ($t^\star < 5$) if none of the participants reduced his demand *or* if demands of the two participants are *compatible* ($f_A + f_B \leqq 100$).

After a trial t you will initially neither be informed about how much the other participant of the other role, assigned to you, demanded nor whether the round already ended. Only after you submitted your demand for all 5 **possible** trials, you will be informed which trial was decisive ($t^\star$), and, which demand was stated in all trials relevant for the calculation of payoffs.

Same paragraph for DYN=1 ...

After each trial t you will be informed about how much the other participant of the other role, assigned to you, demanded and whether there will be an other trial.

...example continued:

Payoffs

Payoffs of participants A and B in one round are calculated as follows.

- If demands of the final trial are *compatible* ($f_A^{t^\star} + f_B^{t^\star} \leqq 100$), then each receives his demand of the final trial, i.e.
  A receives $f_A^{t^\star}$ and B obtains $f_B^{t^\star}$.
- If demands of the final trial are ***not*** *compatible*($f_A^{t^\star} + f_B^{t^\star} > 100$), then each participant receives the difference between 100 ECU and the ***initial demand*** of the other participant, i.e.
  A receives $100 - f_B^0$ and B receives $100 - f_A^0$.

Same paragraph for REL=1 ...

- If demands of the final trial are ***not*** *compatible*($f_A^{t^\star} + f_B^{t^\star} > 100$), then each participant receives the difference between 100 ECU and the demand of the other participant in the prior trial ($t^\star - 1$), i.e.
  A receives $100 - f_B^{t^\star-1}$ and B receives $100 - f_A^{t^\star-1}$.

...example continued:

Bear in mind that condition $f_A^{t^\star} + f_B^{t^\star} > 100$ automatically applies if the round ends due to no participant reducing his demand compared to the previous trial.

In case there is something you did not understand, please don't hesitate to ask one of the supervisors.

Instructions for rounds 5-8

The implementation of each round of the second part is identical to that of the first part. Only the payoff rules change partially:

Payoffs 2. Part

This heading was followed by the relevant paragraph "Payoffs" of the instructions for first four rounds

C. Translation of control questions

Control Questions

The following questions are designed to help you to understand the proceedings and payoff rules of the Experiment. Please answer the questions as good as you can.

Let the total available amount equal 100 Cent. Assume in the following that the initial demands equal $d_A^0 = 70$ for A and $d_B^0 = 90$ for B. This constellation will not be present in the experiment and the examples given are no guidelines!

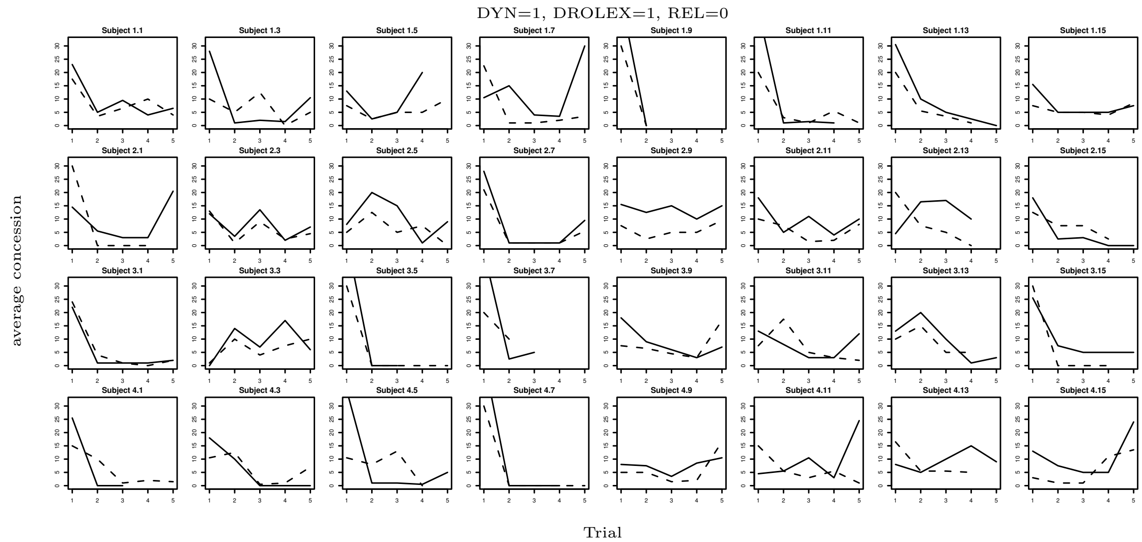
1. Assume in the first trial A and B submit the following demands: $d_A^1 = 69$ and $d_B^1 = 90$. Will there be a second trial? YES / NO
    - If NO: How much do A and B get?
    - If YES: Assume in the 2. trial A and B submit the following demands: $d_A^2 = 0$ and $d_B^2 = 90$.
      Will there be a third trial? YES / NO
        - If NO: How much do A and B get?
2. Assume A and B submit demands $d_A^2 = 69$ and $d_B^2 = 55$ in the second and $d_A^3 = 60$ and $d_B^3 = 50$ in the third trial . Will there be a fourth trial? YES / NO
    - If NO: How much do A and B get?
    - If YES: Assume in the 4. trial A and B submit the following demands: $d_A^4 = 60$ and $d_B^4 = 50$. Will there be a fifth trial? YES / NO
        - If NO: How much do A and B get?
3. Assume in the 1. trial A and B submit the following demands: $d_A^1 = 70$ and $d_B^1 = 90$. Will there be a second trial? YES / NO
    - If NO: How much do A and B get?
    - If YES: Assume in the 2. trial A and B submit the following demands: $d_A^2 = 70$ and $d_B^2 = 0$. Will there be a third trial? YES / NO
        - If NO: How much do A and B get?

Control Questions 2

The following questions are designed to help you to understand the proceedings and payoff rules of the Experiment. Please answer the questions as good as you can.

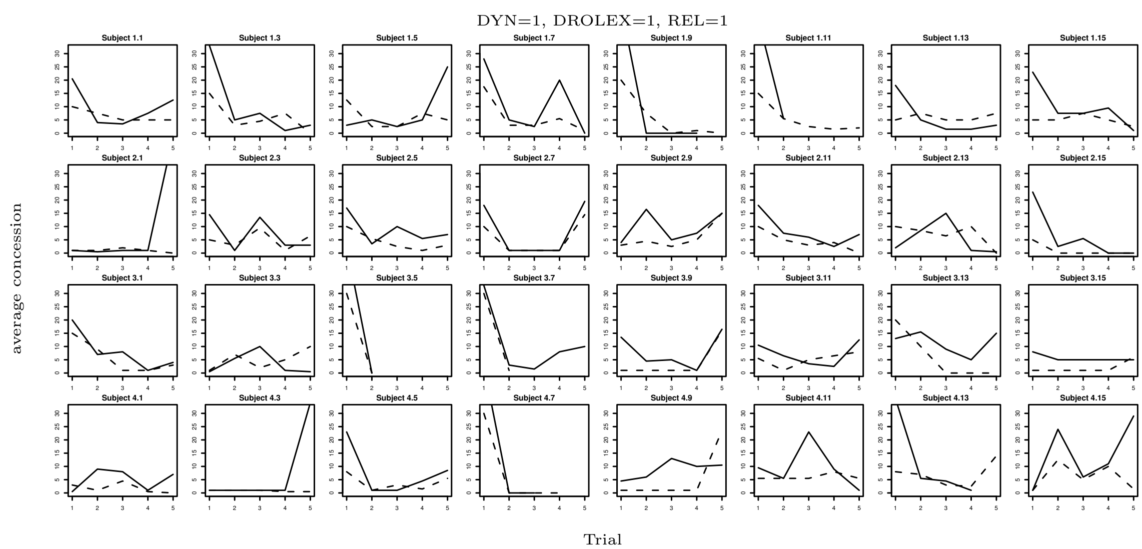
Let the total available amount equal 100 Cent. Assume in the following that the initial demands equal $d_A^0 = 70$ for A and $d_B^0 = 90$ for B. This constellation will not be present in the experiment and the examples given are no guidelines!

1. Assume A and B submit demands $d_A^2 = 69$ and $d_B^2 = 55$ in the second and $d_A^3 = 60$ and $d_B^3 = 50$ in the third trial . Will there be a fourth trial? YES / NO
    - If NO: How much do A and B get?
    - If YES: Assume in the 4. trial A and B submit the following demands: $d_A^4 = 60$ and $d_B^4 = 50$. Will there be a fifth trial? YES / NO
        - If NO: How much do A and B get?
2. Assume in the 1. trial A and B submit the following demands: $d_A^1 = 70$ and $d_B^1 = 90$. Will there be a second trial? YES / NO
    - If NO: How much do A and B get?
    - If YES: Assume in the 2. trial A and B submit the following demands: $d_A^2 = 70$ and $d_B^2 = 0$. Will there be a third trial? YES / NO
        - If NO: How much do A and B get?
3. Assume in the 1. trial A and B submit the following demands: $d_A^1 = 69$ and $d_B^1 = 90$. Will there be a second trial? YES / NO
    - If NO: How much do A and B get?
    - If YES: Assume in the 2. trial A and B submit the following demands: $d_A^2 = 0$ and $d_B^2 = 90$. Will there be a third trial? YES / NO
        - If NO: How much do A and B get?



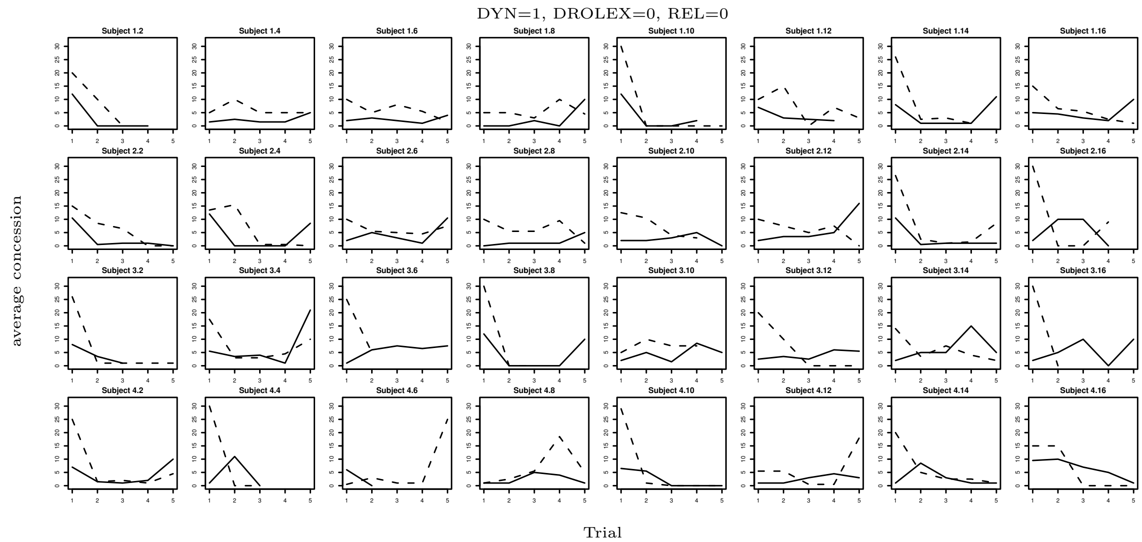
(Ordinate is limited to 32. Missing observations are due to trials never taking place for that particular subject.)

Figure 7: Average concessions of subjects per trial for asymmetric (solid line) and symmetric initial conflict (dashed line): Role X in the dynamic protocol with unreliable concessions



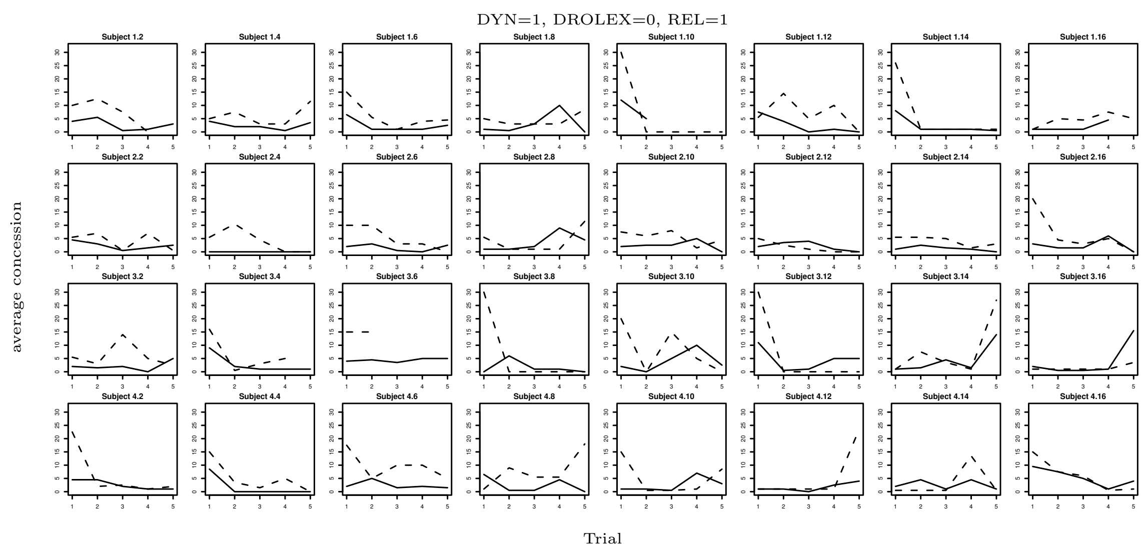
(Ordinate is limited to 32. Missing observations are due to trials never taking place for that particular subject.)

Figure 8: Average concessions of subjects per trial for asymmetric (solid line) and symmetric initial conflict (dashed line): Role X in the dynamic protocol with reliable concessions



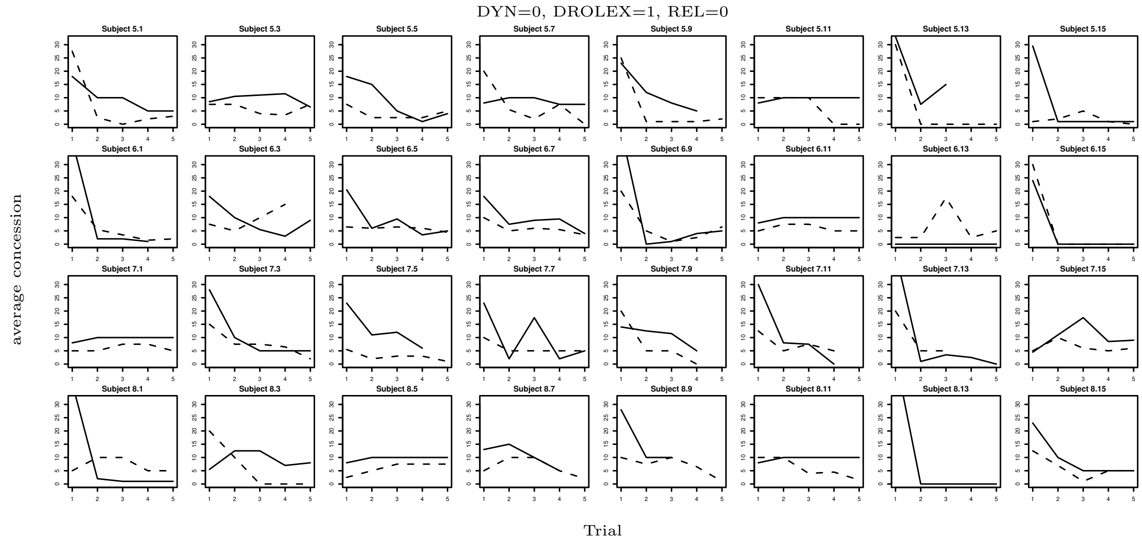
(Ordinate is limited to 32. Missing observations are due to trials never taking place for that particular subject.)

Figure 9: Average concessions of subjects per trial for asymmetric (solid line) and symmetric initial conflict (dashed line): Role Y in the dynamic protocol with unreliable concessions



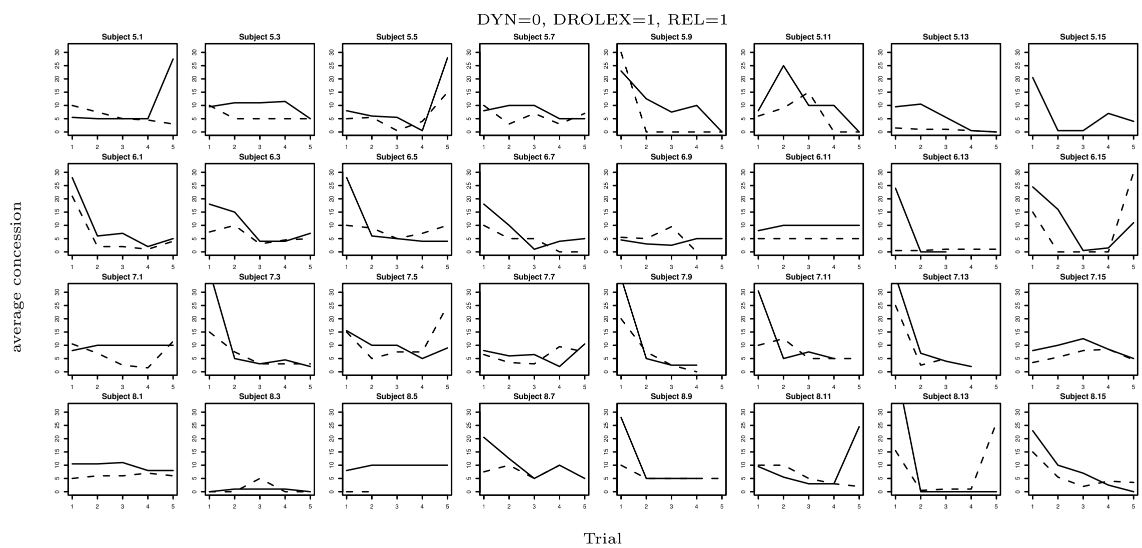
(Ordinate is limited to 32. Missing observations are due to trials never taking place for that particular subject.)

Figure 10: Average concessions of subjects per trial for asymmetric (solid line) and symmetric initial conflict (dashed line): Role Y in the dynamic protocol with reliable concessions



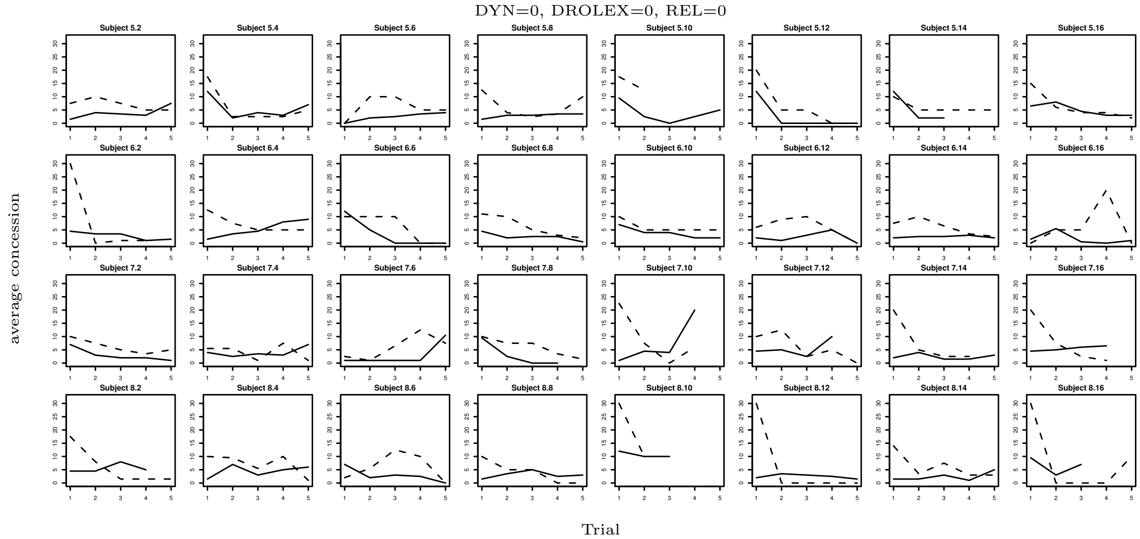
(Ordinate is limited to 32. Missing observations are due to trials never taking place for that particular subject. Matching of demand vectors is identical to that used in the experiment.)

Figure 11: Average concessions of subjects per trial for asymmetric (solid line) and symmetric initial conflict (dashed line): Role X in the static protocol with unreliable concessions



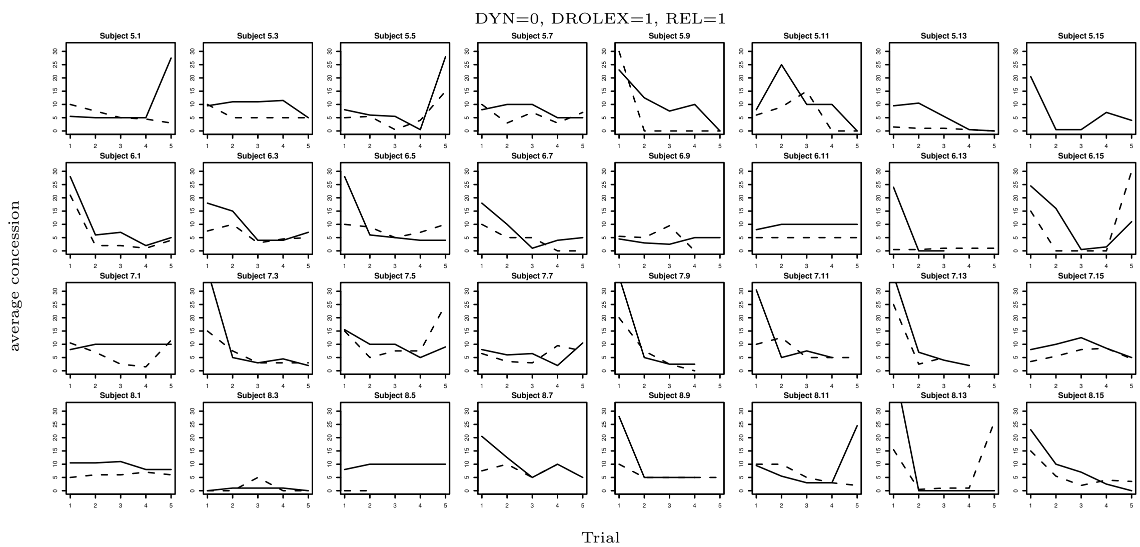
(Ordinate is limited to 32. Missing observations are due to trials never taking place for that particular subject. Matching of demand vectors is identical to that used in the experiment.)

Figure 12: Average concessions of subjects per trial for asymmetric (solid line) and symmetric initial conflict (dashed line): Role X in the static protocol with reliable concessions



(Ordinate is limited to 32. Missing observations are due to trials never taking place for that particular subject. Matching of demand vectors is identical to that used in the experiment.)

Figure 13: Average concessions of subjects per trial for asymmetric (solid line) and symmetric initial conflict (dashed line): Role Y in the static protocol with unreliable concessions



(Ordinate is limited to 32. Missing observations are due to trials never taking place for that particular subject. Matching of demand vectors is identical to that used in the experiment.)

Figure 14: Average concessions of subjects per trial for asymmetric (solid line) and symmetric initial conflict (dashed line): Role Y in the static protocol with reliable concessions