Opting out: An experimental comparison of bazaars versus high-tech markets

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by
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Theory predicts that in alternating-offer bargaining the threat to delay agreement is effectively empty when the proposer can also opt out after a rejection (*high-tech market*), while this is not the case when only the responder can do so (*bazaar*). First proposers therefore have much more bargaining power in the former and get significantly more in equilibrium. This paper reports about an experiment designed to test these predictions. Our results confirm the theoretical predictions once we account for the observed presence of a significant fraction of inequality-averse types in our subject pool. (JEL: C 78, C 91)

1 Introduction

In real life bargaining it is usually open to each bargainer to abandon the negotiations in order to take up an outside option available elsewhere. Clearly these next best opportunities will affect the ultimate bargaining outcome. Yet the exact impact depends on the way in which these outside options manifest themselves. An important characteristic in this respect is the *times* at which the outside options can be taken up. SHAKED [1994] formally analyzes this issue within the context of a RUBINSTEIN [1982] like alternating

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offer bargaining model. He argues that there is a crucial difference between a bargaining situation to which he refers to as the *bazaar*, and a second one which he labels the *high-tech market*.

First consider the bazaar. In this bargaining setting a player is allowed to opt out only just after she has rejected an offer from the other player. The party that made the rejected offer first has to wait for a counter-offer before he can leave the bargaining table. Shaked [1994, p. 422] calls this situation a bazaar, because in a bazaar "... no self respecting seller would allow a customer to leave without making the last offer." He also considers the alternative situation of a high-tech market, in which a player can also opt out after a rejection of her own offer. When trading securities over the telephone, for example, a trader can immediately switch to another trader on another line when his proposal is rejected. He does not have to wait until he receives a counter-offer from his original trading partner.

Although the distinction between the bazaar and the high-tech market may appear subtle, equilibrium predictions are markedly different for the two bargaining games. The infinite horizon bazaar has a unique subgame perfect equilibrium. When the time interval between offers approaches zero this equilibrium satisfies the so-called *outside option principle*. According to this principle the outside options of the two bargainers only act as constraints on the equilibrium division. The surplus up for negotiation is divided in exactly the same way as it would have been in the absence of outside options, unless this division gives one of the bargainers less than his outside option. In the latter case the bargainer with the strong outside option simply obtains a share that exactly matches this outside option whereas the other party gets the remainder of the surplus. In the infinite horizon high-tech market multiple subgame perfect equilibria exist. The driving force behind this result is that a proposer – given her credible threat to opt out after a rejection of her own demand – effectively can make a take-it-or-leave-it demand. The proposer's possibility to opt out then makes the responder's threat to delay agreement empty. As shown by MacLeod and Malcomson [1995] this also applies in the finite horizon case. There it results in the first proposer having all the bargaining power. In the unique subgame perfect equilibrium she captures all the surplus over and above the outside option payoffs.

The key message that follows from the above equilibrium results is that the impact of a player's outside option is relatively more potent in the high-tech market than in the bazaar (Muthoo [1999, pp. 129f.]). However, this key message is solely based on theoretical predictions. Whether the much discussed *theoretical* difference between the bazaar and the high-tech market is indeed relevant *in practice* remains an open issue.[1] This paper presents an experiment to investigate this. The main goal is to establish whether the possibility to opt out after one's own proposal has been rejected indeed gives the proposer more bargaining power. It is also investigated whether the *driving force* behind this theoretical result shows up in practice: Does the proposer's opting out possibility indeed make the responder's threat to delay agreement empty?

Our main findings are as follows. In line with standard predictions the threat to delay is not empty in the bazaar when the outside option is sufficiently unattractive, while it is always effectively empty in the high-tech market. The first proposer therefore does get significantly more in the latter. But, the range of outside option payoffs for which this appears to be the case is smaller than the one predicted by standard theory. An explanation for this is given by the presence of a significant fraction of inequality-averse subjects in our subject pool. Overall we conclude that theory is right in pointing out the differences between the bazaar and the high-tech market; the exact time at which the opting out opportunity becomes available indeed matters. But, the circumstances under which this appears to be the case are highly dependent on the distribution of preferences within the population.

The bazaar *vs.* high-tech market distinction is often interpreted as representing the difference between personal negotiations that take place face-to-face and more impersonal ones that occur over the telephone or via the computer; see *e.g.* Binmore, Osborne, and Rubinstein [1992], Shaked [1994] and Muthoo [1999]. The intuitive idea is that under face-to-face negotiations the channel of communication remains open until a player has physically left the negotiation table. Therefore, the argument goes, a player cannot abandon the negotiations without first listening to a (counter-)offer from her opponent. In modern high-tech markets, however, a bargainer can close the channel of communication right after her proposal has been rejected, simply by hanging up the phone or turning off the computer connection. This interpretation may in fact be a bit far-stretched; casual empiricism suggests

[1] Apart from the original contribution of Shaked [1994] the theoretical difference between the two bargaining protocols is discussed at length in *e.g.* Avery and Zemsky [1994], Binmore, Osborne, and Rubinstein [1992], Muthoo [1999], MacLeod and Malcomson [1995], Osborne and Rubinstein [1990] and Ponsati and Sákovics [1998], [2001]. None of these papers report any empirical evidence for the practical importance of the difference.

that also in face-to-face bargaining the proposer can leave the table immediately after his proposal is rejected. A better interpretation therefore might be that it is a matter of commitment – for the proposer to use the outside option after rejection or not – which makes the difference between the two bargaining situations.

Bargaining with outside options has already been studied in previous experiments. Binmore, Shaked, and Sutton [1989], Binmore *et al.* [1991] and Kahn and Murnighan [1993] study infinite horizon alternating-offer bargaining in which only one party has a positive valued outside option. Knez and Camerer [1995] consider ultimatum game bargaining in which the two parties have different outside option values. Binmore *et al.* [2002] study both one-period and two-period games. None of these papers considers the high-tech market, they all follow the setup of the bazaar. In contrast, this paper focuses on the comparison between these two bargaining protocols.

Like the present experiment, the papers referred to above all consider structured, impersonal negotiations. Kachelmeier and Towry [2002] explicitly compare, for a setting where one of the parties has an outside option, face-to-face bargaining with computerized bargaining that allows for restricted communication only. Interestingly, they do find that the outside option is more potent under computerized bargaining. Unlike our setup, however, this is unrelated to the exact time at which the outside option becomes available; in both treatments the bargainers obtain the outside option (only) when agreement has not been reached within three minutes. The authors argue that personal face-to-face negotiations reinforce preferences for fairness, explaining the difference between their two treatments.

The remainder of this paper is organized as follows. Section 2 describes the two bargaining games that are studied and summarizes the standard equilibrium predictions (*i.e.* assuming pure income maximization) that are put to the test. Section 3 discusses the details of the experimental design. Results are presented in section 4. In section 5 refined predictions based on a model of inequality-aversion are formulated and it is checked whether these can explain the observed differences between standard theory and experimental results. The final section concludes.

2 Theory

2.1 The Two Bargaining Games

We consider the interplay between the responder's threat to delay agreement and the timing of opting out opportunities in the simplest bargaining setting possible. To allow for the actual possibility of delaying agreement, bargaining (potentially) lasts for two periods. In each period there is a perfectly divisible pie of normalized size 1 up for division. Player 1 starts with making a demand $x \in [0, 1]$. In case player 2 accepts this demand, both the period 1 pie and the period 2 pie are shared according to the proposal made and the game ends. So, in that case player 1 obtains $2x$ and player 2 gets $2(1 - x)$. When player 2 rejects the demand and bargaining continues to period 2, the pie of period 1 vanishes. This simply reflects that delay of agreement is costly. In the second period player 2 then can make a counter-demand $y \in [0, 1]$ of how to split the single remaining pie.

The two bargaining games that we study differ in the times at which an outside option can be taken up. First consider the *bazaar* on the left hand part of Figure 1. Apart from accepting or rejecting player 1's first period demand x, player 2 can also choose to opt out. As noted, in case of agreement both pies are divided according to the proposal made, while after rejection the period 1 pie vanishes and the game continues to period 2. But if player 2 opts out in period 1, the game ends and both players get the outside option payoff d (with $0 < d < 1/2$) in each of the two periods.[2] The defining characteristic of the bazaar is that only the responder has the possibility to opt out.

The *high-tech market* on the right hand part of Figure 1 is in all but one respect equivalent to the bazaar. Here also the proposer may opt out after a rejection of her proposal. Player 1 chooses between continuing bargaining and opting out when player 2 has rejected her demand x. If player 1 opts out in period 1, the game ends and both players get their outside option payoff in the two remaining periods. If not, the game continues to period 2.[3]

[2] The assumption that $d < 1/2$ ensures that it is efficient to share the period pies rather than to disagree. We use *symmetric* outside option payoffs for the following reasons. First, differences in bargaining power between the two players are then solely due to the timing of their demands. Second, asymmetry of outside options may induce frequent disagreement stemming from egocentic assessments of fairness (see Knez and Camerer [1995]), which we want to avoid. Third, symmetry makes the formulation of predictions based on inequality-aversion (see section 5) easier and more clear cut.

Figure 1a

The Bazaar

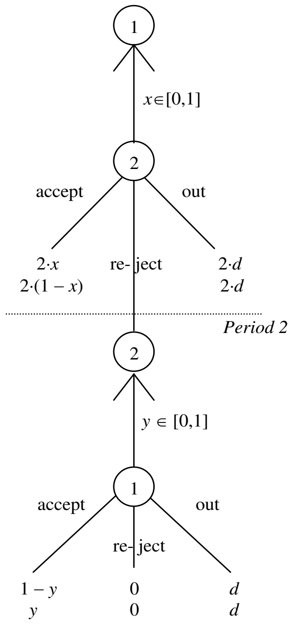
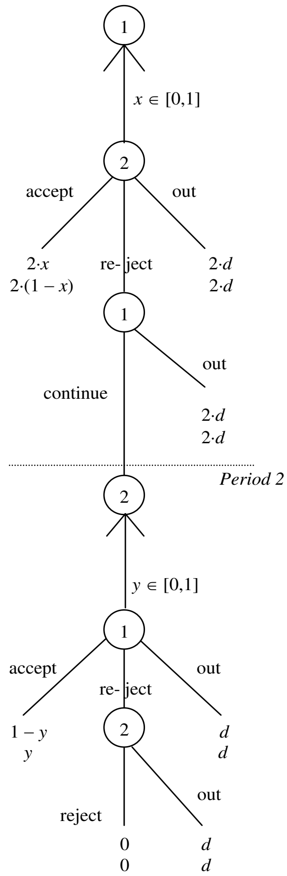


Figure 1b

The High-Tech Market



2.2 Standard Equilibrium Predictions

Proposition 1 below presents the subgame perfect equilibrium outcomes of the bargaining games formally described in the previous subsection (see Figure 1), assuming that both players are pure income maximizers. In this

[3] In general, the choice between reject/continue and opting out represents a choice between temporary and permanent disagreement. Per period payoffs when parties temporarily disagree are sometimes called *inside options*. In our setup these inside option payoffs fall short of the outside option payoffs and are normalized to zero. In general this need not be the case though; see MUTHOO [1999, p. 147] for an example. Note that even in the final period 2 the parties can choose between inside options and outside options. Experimentally this has the advantage that the period games then have exactly the same structure.

proposition x_1^* denotes the equilibrium share player 1 demands (and obtains) for herself in period 1. As before, demands always refer to the share of each (remaining) per period pie.

PROPOSITION 1 *The subgame perfect equilibrium outcomes of the two bargaining games equal:*

Bazaar: (i) If $d < 1/3$, *then player 1 demands a share of* $x_1^* = (1/2) \cdot (1+d)$, *which is accepted by player 2 who obtains a share equal to* $1 - x_1^* = (1/2) \cdot (1-d)$*; (ii) If* $1/3 < d < 1/2$, *then player 1 demands a share of* $x_1^* = 1 - d$, *which is accepted by player 2 who obtains a share of* $1 - x_1^* = d$*;*

High-tech market: Player 1 demands a share of $x_1^* = 1 - d$, *which is accepted by player 2 who obtains a share of* $1 - x_1^* = d$.

To arrive at these equilibrium outcomes, notice that in both bargaining games the subgame starting in period 2 resembles a standard ultimatum game. The main difference is the presence of the outside option payoffs. In a subgame perfect equilibrium player 2 demands and gets $y_2^* = 1-d$ in period 2, leaving the remainder of the pie to player 1. So, when play continues to period 2, player 1 obtains d and player 2 gets $1-d$ in total.

Now consider period 1 of the bazaar (see Figure 1a). When player 2 rejects the demand of player 1 bargaining necessarily prolongs to the second period. A rejection thus gives player 2 a monetary payoff of $1-d$, opting out yields him $2d$. His threat to delay agreement is stronger than his threat to opt out when $1 - d > 2d$, *i.e.* whenever $d < 1/3$. Player 1 simply makes the largest demand player 2 is still willing to accept. From $2(1-x) = (1-d)$ the equilibrium demand of player 1 in case (i) follows. If $d > 1/3$ the opting out threat of player 2 is stronger than his threat to delay. Opting out yields player 2 a payoff of $2d$, which is d per period. The largest demand player 2 is willing to accept then equals $x_1^* = 1 - d$. This yields case (ii) of the bazaar.

Things are different in the high-tech market, see Figure 1b. After a rejection by player 2 in the first period, player 1 now has to choose between continuing bargaining and opting out. Continue yields her d, while Out gives $2d$. Clearly player 1 opts out in this case. As a result, both rejecting player 1's demand and opting out yield player 2 a payoff of $2d$. Given that this is the most player 2 can get by not accepting, player 1 demands the largest amount player 2 is willing to accept. Note that in the high-tech market the threat of player 2 to delay agreement is effectively empty for any $d > 0$, because player 1 always prefers to opt out after a rejection of her demand.

The important theoretical difference between the two bargaining games is the effective presence of a threat to delay in the bazaar when $d < 1/3$. The two games therefore differ in their equilibrium outcomes when d is sufficiently low. In particular, player 1 gets strictly more in the high-tech market than in the bazaar. Since this is the main theoretical prediction we want to test experimentally, we summarize it in a corollary of Proposition 1.

COROLLARY 1 *If $d < 1/3$, then standard theory predicts that player 1 demands and obtains a larger share in the high-tech market than in the bazaar.*[4]

Apart from establishing whether player 1 is indeed better off in the high-tech market, we also want to detect the effective presence of the delay threat in the actual bargaining outcomes. We will do so in three complementary ways. The first one is based on the opposing comparative statics in d. In the high-tech market x_1^* is decreasing in d. This holds because here the opting out threat of player 2 is strongest, and the stronger this threat becomes the less player 1 gets. In contrast, in the bazaar the threat to delay is strongest and hence x_1^* increases with d. The intuition here is that, apart from being the first proposer, player 1 is also the last responder. The outside option payoff d enters the equilibrium shares only because in period 2 player 1's threat to delay is necessarily empty. Player 2 then simply gives player 1 her outside option payoff and he himself obtains the remainder. His threat to delay agreement in period 1 is thus proportional to $1 - d$. The larger d, the weaker player 2's threat to delay becomes. As a result player 1 gets a larger equilibrium share in the bazaar when d increases.[5]

The effective presence of the delay threat becomes even more apparent when we compare the outcomes of the two bargaining games with those of their one-period versions. Figure 2 provides the extensive forms of the one-period games. In these games the threat to delay is empty by definition. This holds for both the bazaar and the high-tech market. As a result, in the one-period games the equilibrium demand of player 1 equals $x_1^* = 1 - d$.

[4]This corollary in fact holds for any length of the bargaining game $T \geq 2$. In the high-tech market $x_1^* = 1 - d$ irrespective of the actual length T. In the bazaar the equilibrium shares for $d < 1/3$ equal $x_1^* = 1/2 + (1/T) \cdot d$ when T is even and $x_1^* = 1/2 + (1/T) \cdot ((1/2) - d)$ when T is odd. In case $1/3 < d < 1/2$ the equilibrium analysis for the bazaar is more involved; see Proposition 1(iv) in SLOOF [2004] for a comprehensive discussion of this case.

[5]This prediction depends on the length of the bargaining game T being even. When T is odd, such that player 2 is the last responder, it holds that x_1^* is decreasing in d.

In the high-tech market equilibrium predictions are thus independent of the length of the bargaining game $T \in \{1, 2\}$. For the bazaar this is not the case when $d < 1/3$. Player 1 then gets a smaller share in the two-period game than in the one-period game: $(1/2) \cdot (1 + d) < (1 - d)$. These comparative statics in T are used as another test for the presence of an effective delay threat in the actual bargaining outcomes.

Figure 2a

The One-Period Bazaar (T = 1)

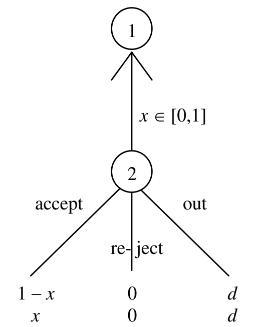
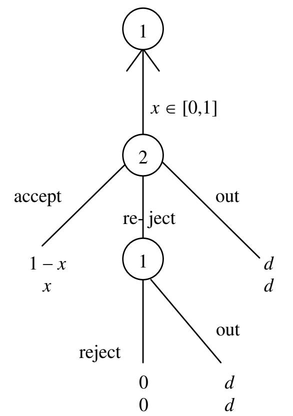


Figure 2b

The One Period High-Tech Market (T = 1)



The third method we employ considers the interaction effects between the level of the outside option payoff d and the length of the bargaining game T. In the high-tech market comparative statics in d are independent of T, so interaction effects are absent. This does not hold for the bazaar. There theory predicts a significantly positive interaction effect, because x_1^* decreases with d when $T = 1$ and increases with d when $T = 2$.

Because the above comparative statics predictions are the second focus of our empirical tests, we summarize them in a corollary as well.

COROLLARY 2 *If $d < 1/3$, then standard theory predicts that in the two-period bazaar the threat to delay agreement fully determines the bargaining outcome, while in the two-period high-tech market the threat to delay is effectively empty and does not affect the outcome. This implies that:*

(a) In the two-period bazaar (high-tech market), the share player 1 obtains increases (decreases) with the level of the opt-out option d;

(b) Player 1 gets a smaller share in the two-period bazaar than in the one-period bazaar, while in the high-tech market player 1's share is independent of the length of the bargaining game T;

(c) In the bazaar (high-tech market) the comparative statics relationship between player 1's share and d does (not) interact positively with T.

3 Experimental Design

The experiment was based on a 2×2×2 design. We considered two bargaining games, two bargaining lengths ($T = 1$ and $T = 2$) and two levels of the outside option payoff. For ease of presentation to the subjects, the size of the period pies always equalled 1000 experimental points. The outside option was similarly scaled upwards: $D \equiv 1000 \cdot d$. The two different levels chosen equalled $D = 40$ and $D = 290$ respectively. Within the relevant range of $0 < D < 333.33$ (see Corollaries 1 and 2) the first value can be considered low while the second one can be considered high. The equilibrium demands belonging to our parameter choices appear in Table 1. Rather than these point predictions, the hypotheses of interest are the corresponding comparative statics predictions summarized in Corollaries 1 and 2.

Table 1

Predicted (accepted) Opening Demands

Length	Option level	Bazaar	High-Tech
$T = 2$	$D = 40$	520	960
	$D = 290$	645	710
$T = 1$	$D = 40$	960	960
	$D = 290$	710	710

In each session only one type of bargaining game was considered. All subjects within a session were confronted with both values of D and with both the one-period and the two-period game. We ran two sessions per bargaining game, such that we had four sessions in total. These were held in June 2001. Overall 80 subjects participated in the experiment, with 20 participants per session. The subject pool consisted of the undergraduate student population of the University of Amsterdam. 52% of them were students in economics. Subjects received a show up fee of 5000 experimental points. The conversion rate was one guilder for 500 points, such that one US dollar corresponded with 1275 points. Average earnings were USD 21.75 in less than two hours.

Each session contained 32 rounds, divided in four blocks of four pairs of rounds. The first block consisted of the pairs of rounds 1–2, 3–4, 5–6 and 7–8. The second block consisted of the four pairs of rounds 9–10, 11–12, 13–14, and 15–16 *etc.* In each first round of a pair the one-period game was played. In every second round of a pair the two-period game was played. The eight rounds within a block all had the same value of D. For both bargaining games we had an *UP* and a *DOWN* session. In the former the order of D's over the four blocks equalled $(40, 290, 40, 290)$. In the latter it was $(290, 40, 290, 40)$. The rationale behind this particular block structure is that it allows a test on the presence of learning effects, by comparing subjects' behavior in block one (two) with their behavior in block three (four). By comparing the UP and the DOWN sessions we can test for order effects.

Subjects' roles varied over the rounds. Within each block of eight rounds each subject was assigned the role of player 1 exactly four times, and the role of player 2 also four times. Every subject had different roles within the two rounds of a pair. For example, when a subject was player 1 in the one-period game, she had the role of player 2 in the two-period game. In that way the first round within a pair gave each subject experience with the second period subgame of the two-period game played in the second round within a pair. This nested subgame design, inspired by Harrison and McCabe [1992], was meant to facilitate gaining experience and learning of backward induction. In each round subjects were anonymously paired. Within a block of eight rounds they could meet each other only once. In particular, in the two rounds belonging to the same pair subjects were matched to two different opponents. Subjects were informed about this.

In all four sessions we added a second part to the experiment. This part was announced only *after* the 32 rounds were played. In part two subjects had to formulate complete strategies of how to play the one-period game, for both values of D separately. Specifically, they were asked their demand were they assigned the role of player 1, and in case of the high-tech market also their reaction to a rejection of their demand. Their strategies as player 2 were restricted to the following format. They could define up to three closed intervals of demands. For each interval they had to indicate their reaction: either accept, reject or opt out. This reaction then applied to all demands within the interval. Subjects were not restricted to three intervals, they could also define two or just one. Yet their specification had to cover the complete range of demands from 0 to 1000 points.

After subjects had formulated their strategies one additional round was played. Subjects were randomly paired and assigned roles, and the value of D was randomly chosen. The earnings of this additional round were multiplied by 5 and added to those of the first part. The reason for adding the strategy part is that it provides sharper estimates of the inequality-aversion parameters of each individual (see section 5). These estimates can then be used for a consistency check with the actual play in the earlier 32 rounds.

The experiment was computerized. Subjects started with on-screen instructions. All subjects had to answer a number of questions correctly before the experiment started. For example, they had to calculate their earnings for some hypothetical situations. Subjects also received a summary of the instructions on paper, together with a schematic representation of the decision situation (see Appendix A.2). The instructions and the experiment were phrased neutrally. Words like opponent, game, bargaining and player were avoided. After the second part subjects filled out a short questionnaire. At the end of the experiment the earned experimental points were exchanged for money. Subjects were paid individually and discreetly.

4 Practice

In this section we present the findings of our experiment. The presentation is divided into two subsections which deal with opening demands and responder (*i.e.* player 2) behavior respectively.

4.1 Opening Demands

Within each session the first (second) and the third (fourth) block of 8 rounds are equal, as they consider the same outside option value D. In our analyses we pool the data from these similar blocks, because no significant learning effects can be detected.[6] However, we do find some significant order effects. We thus cannot pool the data from the UP and DOWN sessions that were held for each bargaining game.[7] Between game comparisons are therefore

[6]Using Wilcoxon signed-rank tests we found no significant differences in (accepted) opening demands between the blocks within a session that considered the same value of D. This holds for the one-period games as well as the two-period games. These tests are based on both the individual mean opening demands and the individual mean *accepted* opening demands per (D, T)-combination, comparing blocks 1 and 3 and blocks 2 and 4 respectively. Overall 32 comparisons are made. None of these is significant at the 5%-level.

based on pair-wise comparisons for each order separately. Our first result concerns this comparison of bargaining outcomes (see Corollary 1).

RESULT 1 (BAZAAR VERSUS HIGH-TECH MARKET) *Player 1 demands and obtains a significantly larger share in the two-period high-tech market than in the two-period bazaar when $D = 40$, but not so when $D = 290$.*

Evidence supporting Result 1 is reported in Table 2. The upper panel of this table reports mean opening demands, the lower panel the mean *accepted* opening demands. Both panels include the test statistics (p-values) for equality of demands across treatments. For both values of D subjects had the role of player 1 exactly eight times, evenly divided over the one-period game and the two-period game. For each subject we calculated his mean (accepted) demand separately for each treatment. Statistical tests are based on these individual means. In evaluating the test results we employ a significance level of 5% throughout. Result 1 then directly follows from the reported p-values for the two-period games in the columns 'B *vs.* H'.
Table 2 also presents the p-values for the comparison between the bazaar and the high-tech market when $T = 1$. Theory predicts no significant differences in these cases. This is by and large what we observe. Only when $D = 40$ in the DOWN-order, accepted opening demands differ at the 5%-level. Because only one out of eight possible comparisons reaches significance, we feel that it is justified to conclude that the two bargaining games do not differ when $T = 1$.

Result 1 confirms the prediction reflected in Corollary 1 for the case where $D = 40$, but not so for $D = 290$. In the latter case player 1 does not appear to have more bargaining power in the high-tech market, in contrast to what theory predicts for the two-period games. A potential explanation for this finding is that for $D = 290$ the threat to delay agreement is also effectively empty in the bazaar. We next turn to this issue.

In order to detect the effective presence of the delay threat in the actual bargaining outcomes, three complementary methods will be employed (see

[7] The sessions that consider the same bargaining game are compared by means of Mann-Whitney ranksum tests. For the bazaar we find significant differences when $T = 2$, for the high-tech market when $D = 40$. In both cases individual mean (opening) demands are significantly larger under the UP-ordering. A similar result is found by BINMORE *et al.* [2002]. They also observe that when a session starts with outside option payoffs that induce more asymmetric divisions, this leads to outcomes in subsequent treatments that are also more asymmetric.

Table 2

Mean (accepted) Opening Demands and Tests for Equality

	T	D	UP Bazaar	UP High-Tech	UP B *vs.* H	DOWN Bazaar	DOWN High-Tech	DOWN B *vs.* H
all demands	$T=2$	40	685	739	0.0397	630	672	0.0423
		290	623	615	0.9567	597	611	0.2231
		40 *vs.* 290	0.0021	0.0001		0.0400	0.0006	
	$T=1$	40	773	778	0.9461	750	705	0.0563
		290	627	628	0.9891	620	630	0.2727
		40 *vs.* 290	0.0001	0.0001		0.0001	0.0006	
	$T=2$ *vs.* $T=1$	40	0.0004	0.0303		0.0001	0.0699	
	$T=2$ *vs.* $T=1$	290	0.5250	0.7352		0.0094	0.0554	
accepted demands	$T=2$	40	645 (53)	707 (53)	0.0357	595 (55)	640 (57)	0.0493
		290	615 (64)	604 (65)	0.9022	587 (64)	592 (56)	0.4701
		40 *vs.* 290	0.0058	0.0010		0.0555	0.0095	
	$T=1$	40	756 (64)	757 (62)	0.9514	738 (70)	686 (66)	0.0085
		290	619 (69)	617 (67)	0.9645	611 (68)	614 (60)	0.6313
		40 *vs.* 290	0.0003	0.0003		0.0003	0.0021	
	$T=2$ *vs.* $T=1$	40	0.0057	0.0866		0.0003	0.0773	
	$T=2$ *vs.* $T=1$	290	0.4311	0.7939		0.0774	0.0543	

Remark: The columns denoted 'B *vs.* H' report the p-values of Mann–Whitney ranksum tests. The rows labeled '40 *vs.* 290' and those labeled '$T = 2$ *vs.* $T = 1$' give the p-values of Wilcoxon signed-rank tests. Overall means are based on 80 observations for all opening demands. In parentheses appear the number of individual observations (out of 80) in which the opening demand was accepted.

Corollary 2). Our overall assessment will be based on the results of all three of them together. We first look how bargaining outcomes vary with the level of the outside option.

Result 2 (comparative statics in D) *In both the two-period bazaar and the two-period high-tech market (accepted) opening demands are significantly decreasing in D.*

This result is based on a comparison of the individual mean (accepted) opening demands for $D = 40$ with those for $D = 290$, by means of Wilocoxon signed-rank tests. The test results are reported in the rows labeled '40 *vs.* 290' in Table 2. In all but one out of 8 comparisons differences are significant at the 5% level; mean (accepted) opening demands are smaller when $D = 290$. The single exception occurs for accepted opening demands in the bazaar under the DOWN order. Here the p-value equals 0.0555, which is very close to significance. We therefore arrive at Result 2 above.[8] This result is in line with Corollary 2(a) for the high-tech market, but not for the bazaar. In the latter bargaining game an increasing relationship was predicted.

Result 3 (comparative statics in T) *(i) In the bazaar player 1 obtains a significantly smaller share in the two-period game than in the one-period game when $D = 40$, but not so when $D = 290$. (ii) In the high-tech market player 1's share is independent of the length of the bargaining game.*

Result 3 follows from the p-values reported in the rows '$T = 2$ *vs.* $T = 1$' in Table 2. Again we employ a significance level of 5%. Out of the 8 possible comparisons for overall opening demands, we find 4 significant differences according to a signed-rank test. Two of these remain significant when we look at accepted opening demands only. For both orders we find that in the bazaar with $D = 40$ (accepted) opening demands are significantly lower in the two-period game than in the one-period game.[9] Hence our findings

[8]Exactly the same result is obtained from estimating fixed effect regression equations like those reported in Table 3 below, when we restrict these regressions to the two-period games only. The fixed effect regressions of the full sample are discussed below in the context of Result 4.

[9]Here it must be noted though that some of the p-values are close to significance and that Result 3 would change if we would consider a 10% level of significance instead. In the high-tech market, for instance, 6 out 8 comparisons are significant at this higher level. This suggests that under this bargaining protocol, there may be some (negative) impact of the length of the bargaining game. But, as Result 4 below reveals, this impact does not

contrast with Corollary 2(b) when $D = 290$ in the bazaar. In the other cases comparative statics in T are in line with the theoretical predictions.

Result 2 above just looks at the sign of the comparative statics in the outside option level. Our final result concerns how the strength of these comparative statics in D varies with the length of the bargaining game T.

RESULT 4 (INTERACTION BETWEEN D AND T) *(i) In the bazaar the negative relationship between (accepted) opening demands and D is significantly less steep in the two-period game than in the one-period game. (ii) In the high-tech market the negative relationship between (accepted) opening demands and D is independent of the length of the bargaining game.*

For each session we estimate a fixed-effect regression equation with the individual mean (accepted) opening demand as dependent variable. As regressors we include D and an interaction term $D \cdot I_{two}$, which equals D when the observation concerns the two-period game and 0 otherwise. In order to control for subject specific characteristics the regressions also incorporate subject-bargaining length specific dummy variables. Table 3 reports the estimates of the two coefficients of interest. The estimated coefficients on D reveal that in the one-period game the decrease in (accepted) opening demands is less than proportional with the increase in D, but always significantly different from zero. The coefficients for the interaction term $D \cdot I_{two}$ indicate whether this relationship is different in the two-period games. The interaction term thus reveals whether the mere possibility to delay agreement affects the relationship. In the high-tech market this appears not to be the case, as the interaction term is never significant. Comparative statics in the outside option level are thus independent of the length of the bargaining game. In contrast, in the bazaar the slope appears to be significantly less steep in the two-period game. Both findings are in line with Corollary 2(c).
Overall, for the high-tech market Results 2 through 4 are all in line with the theoretical predictions spelled out in Corollary 2. This indicates that the threat to delay agreement is indeed effectively empty in the high-tech market, just as standard theory predicts. For the case of the bazaar there are some deviations from the theoretical predictions. In particular, here Result 3(i) suggests that player 1 has an effective delay threat when $D = 40$, but not so when $D = 290$. This interpretation is in line with Results 2 and 4(i) for

interact with the value of D and therefore does not convincingly indicate the presence of an effective delay threat.

Table 3
Regressions Explaining (accepted) Opening Demands

Dep. variable	Regressor	UP Bazaar	UP High-Tech	DOWN Bazaar	DOWN High-Tech
all demands	D	-0.582 [-1]	-0.601 [-1]	-0.523 [-1]	-0.299 [-1]
		(0.077)***	(0.069)***	(0.057)***	(0.052)***
	$D \cdot I_{two}$	0.333 [1.5]	0.105 [0]	0.390 [1.5]	0.057 [0]
		(0.109)***	(0.097)	(0.081)***	(0.074)
	n	80	80	80	80
	R^2	0.638	0.771	0.703	0.589
accepted demands	D	-0.556 [-1]	-0.563 [-1]	-0.528 [-1]	-0.290 [-1]
		(0.072)***	(0.077)***	(0.051)***	(0.058)***
	$D \cdot I_{two}$	0.368 [1.5]	0.093 [0]	0.414 [1.5]	0.067 [0]
		(0.107)***	(0.116)	(0.076)***	(0.087)
	n	73	69	71	65
	R^2	0.678	0.733	0.791	0.598

Remark: Numbers in parentheses are standard errors, numbers within square brackets refer to the theoretical predictions. All coefficients marked with superscript *** are significantly different from 0 at the 1% level. All other coefficients are insignificant (lowest p-value is 0.286). The indicator function I_{two} equals 1 when $T = 2$ and 0 otherwise.

the bazaar. That in the bazaar the threat to delay agreement is effectively present only when $D = 40$ can in turn explain why the two bargaining games differ for $D = 40$, but yield the same outcome when $D = 290$ (see Result 1). In section 5 we investigate whether the presence of inequality-averse individuals within our subject pool can provide an explanation for the deviations we observe from standard predictions.

4.2 Responder Behavior

This subsection provides a descriptive analysis of responder (*i.e.* player 2) behavior. As these results are not used to test the main hypotheses summarized in Corollaries 1 and 2, the description is kept brief. First consider the one-period game. In each session there were 80 plays of this game with $D = 40$ and 80 plays with $D = 290$. Table 4 provides an overview of the responses of player 2 to the demands made. There appears to be minor variation over the sessions. Overall we observe that in 82% of the cases the demand is accepted, while in 15% of the cases player 2 opted out. Rejection occurs in 3% of the cases. Given that in almost all instances (636 out of 640) player 1 at least offers player 2 an amount equal to the outside option, standard theory predicts an acceptance rate of over 99%. Inequality-aversion (together with private information about preferences) can provide an explanation for the lower acceptance rate observed in the experiment. When player 2 dislikes unequal payoffs, he may prefer to reject very unequal proposals to arrive at a more equal outcome by opting out. In the next section we elaborate on this.

Table 4
Player 2's Reaction to Player 1's Demand in the One-Period Game

		UP		DOWN	
	Reaction	Bazaar	High-Tech	Bazaar	High-Tech
$D = 40$	Accept	80% (64)	78% (62)	88% (70)	83% (66)
	opt out	18% (14)	18% (14)	11% (9)	9% (7)
	reject	3% (2)	5% (4)	1% (1)	9% (7)
			[3 out of 4]		[4 out of 7]
$D = 290$	accept	86% (69)	84% (67)	85% (68)	75% (60)
	opt out	14% (11)	15% (12)	15% (12)	20% (16)
	reject	0% (0)	1% (1)	0% (0)	5% (4)
			[1 out of 1]		[4 out of 4]

Remark: Numbers in parentheses report the number of individual observations (out of 80) on which the percentage is based. For the high-tech markets, numbers within square brackets indicate the number of instances in which player 1 opted out after a rejection by player 2.

Table 5 gives an overview of the responses to the opening demands in the two-period games. Although there is some variation over the sessions, the following general picture emerges. When $D = 40$ opting out is unattractive and occurs in just 2% of the cases. Rejection is observed in about 30% of the interactions. In the remaining 68% there is immediate agreement. For $D = 290$ immediate agreement (78%) and opting out (11%) occur more often. Rejection by player 2 then occurs substantially less (12%). These results suggest that in both bargaining games the actual threat to delay agreement is much weaker when D is high than when D is low. One clear caveat applies here though, because the observed responses are conditional on the opening demands made. Based on the actual demands, theory predicts for the high-tech market an acceptance rate of 100% when $D = 40$ and 98% for $D = 290$.[10] For the bazaar these numbers equal 11% and 71% respectively. The low predicted rate for $D = 40$ results because player 1 typically (*i.e.* in 142 out of 160 cases) demands more than 520 for herself and player 2 should reject.

Table 5

Player 2's Reaction to Opening Demand in the Two-Period Game

		UP		DOWN	
	Reaction	Bazaar	High-Tech	Bazaar	High-Tech
$D = 40$	accept	66% (53)	66% (53)	69% (55)	71% (57)
	opt out	4% (3)	1% (1)	0% (0)	4% (3)
	reject	30% (24)	33% (26)	31% (25)	25% (20)
			[5 out of 26]		[2 out of 20]
$D = 290$	accept	80% (64)	81% (65)	80% (65)	70% (56)
	opt out	10% (8)	10% (8)	9% (7)	14% (11)
	reject	10% (8)	9% (7)	11% (9)	16% (13)
			[3 out of 7]		[5 out of 13]

Remark: Numbers in parentheses report the number of individual observations (out of 80) on which the percentage is based. For the high-tech markets, within square brackets appear the number of instances in which player 1 opted out after a rejection by player 2.

Finally we look at second period behavior. Table 6 reports the mean (accepted) demands of player 2 together with the acceptance rates and the percentage of disadvantageous counteroffers player 2 makes. Compared to those of period 1, demands display a clear downward shift. Acceptance rates

[10] This follows because in 4 out of 160 instances where $D = 290$ in the two-period high-tech market, player 1 demands more than 710 for herself. In case $D = 40$ she never demands more than 960.

are also lower, overall now around 67%. The percentage of disadvantageous counteroffers refers to the fraction of player 2's second period demands that yield him less than acceptance of player 1's demand in period one would have done. Disadvantageous counteroffers are typically seen as a key indicator of fairness considerations also being part of subjects' utility functions, see *e.g.* Camerer [2003, p. 166]. Besides simple monetary income, subjects may also care about obtaining a fair distribution of the available surplus. For $D = 290$ the percentages of disadvantageous counteroffers observed here are line with those reported in Roth [1995, p. 265] for two-period alternating offer bargaining games. Those obtained when $D = 40$ are considerably lower.

Comparing the demands of player 2 with those observed in the one-period games, it appears that players 2 are more generous on average than players 1 are in the one-period game. Binmore *et al.* [2002] obtain a similar finding and take this as evidence for the failure of subgame consistency; actual play in a subgame is not independent of its position in a larger game. Even though player 2 demands for less, acceptance rates are also lower. An explanation for these differences is selection. A selection bias occurs because player 2 has to reject player 1's opening demand to reach the second period subgame. Players 2 with a preference for fairness are more likely to reject a given opening demand than completely selfish types are. They are also more inclined to distribute the surplus more evenly, explaining the lower second period demands. At the same time player 1 may feel angry because player 2 rejected her demand in the first place and therefore reciprocate by rejecting his demand as well. This might explain the lower acceptance rates.

5 *Inequality-Aversion*

The theoretical predictions derived in section 2 are based on the assumption that agents are solely driven by own monetary income. In reality this is typically not the case, as a substantial fraction of the subjects in a variety of experiments reveals a concern for fairness and reciprocity (see Fehr and Gächter [2000]). The experimental findings reported in section 4 also hint at the importance of these motivational factors. For example, compared to the predicted levels (see Table 1), actual opening demands intend to divide the available surplus much more equally. In this section we investigate whether subjects' tastes for equality can account for the observed deviations from the standard predictions based on pure income maximization.

In their overview article Fehr and Schmidt [2002] distinguish two types

Table 6
Mean of Second Period Demands and Responses

		UP		DOWN	
		Bazaar	High-Tech	Bazaar	High-Tech
$D = 40$	all	585 (24)	489 (21)	703 (25)	613 (18)
	accepted	523 (15)	452 (15)	667 (16)	546 (12)
	acc. rate	63%	71%	64%	67%
	% disadv.	25%	29%	16%	33%
$D = 290$	all	488 (8)	525 (4)	575 (9)	557 (8)
	accepted	450 (4)	500 (3)	568 (7)	500 (6)
	acc. rate	50%	75%	78%	75%
	% disadv.	88%	50%	89%	75%

Remark: Numbers in parentheses report the number of individual observations on which the mean is based.

of theories of fairness and reciprocity. The first type assume that some agents have "social preferences" and also care about the payoffs of others. The second type of theories focus on "intention-based reciprocity" and assume that agents care about the intentions of their opponents. Here agents have to interpret the behavior of the other players and the formal analysis requires the framework of psychological game theory. This makes these models rather complicated and less suitable for predictive purposes. We therefore confine ourselves to a simple model of social preferences.[11]

Like Fehr and Schmidt [1999] we assume that players' preferences take the following form (see Bolton and Ockenfels [2000] for a related specification):

$$(1) \quad U_i(m_i, m_j) = m_i - \alpha_i \cdot \max\{m_j - m_i, 0\} - \beta_i \cdot \max\{m_i - m_j, 0\}, \text{ with } i \neq j$$

Here m_i refers to the monetary payoff of player i (for $i = 1, 2$). As in Fehr

[11] It is important to note though that our experiment should not be taken as providing a test of the inequality-aversion model *per se*. It may very well be the case that other types of social preferences – like *e.g.* negative interdependent preferences introduced in Lopomo and Ok [2001] – lead to similar predictions as inequality-aversion does. The same may apply for models incorporating intention-based reciprocity, see *e.g.* Charness and Rabin [2002] and Dufwenberg and Kirchsteiger [2004]. Inequality-aversion is used here only as a means to account for more general motives in a very simple manner.

and Schmidt it is assumed that $\alpha_i \geq \beta_i \geq 0$. The second term in the utility function then measures the utility loss from disadvantageous inequality, while the third term measures the loss from advantageous inequality. In addition, we also assume $\beta_1 \neq 1/2$ and $\beta_2 \neq 1/2$. This excludes degenerate cases in which a player is indifferent between any division that weakly favors himself.

A characteristic feature of the inequality-aversion model is that people are heterogeneous and have incomplete information about the preferences of others. This makes the derivation of equilibrium predictions for the general incomplete information case rather complicated. We therefore proceed in two steps. We first estimate parameters α^k and β^k for each individual k within our subject pool. We do so by employing the data on the one-period games obtained in the second (strategy) part of the experiment. In a second step we then use these estimates to refine our predictions for the two-period games and check whether these refined predictions can explain the main observed differences between the bazaar and the high-tech market.

5.1 Type Distribution within the Subject Pool

We first state the equilibrium predictions for the one-period games, assuming that players' preferences are given by (1). As in section 2 these predictions are formulated for a normalized per period pie of size 1 and $d \equiv D/1000$. Because we now assume two-sided private information, the perfect Bayesian equilibrium concept is employed.

Proposition 2 *Let players' preferences be given by* (1) *and assume that players are privately informed about their (α, β)-type. In the one-period games player 2 accepts demand x whenever $l(\beta_2, d) \leq x \leq h(\alpha_2, d)$ and opts out otherwise. Here:*

$$l(\beta_2, d) \equiv \frac{\beta_2 - \min\{1-d, \beta_2\}}{2\beta_2 - 1} < \frac{1}{2} \quad \textit{and} \quad h(\alpha_2, d) \equiv \frac{\alpha_2 + (1-d)}{2\alpha_2 + 1} > \frac{1}{2}.$$

If player 1 believes that α_2 lies within the interval $[\underline{\alpha}, \overline{\alpha}]$, with $0 \leq \underline{\alpha} \leq \overline{\alpha} < \infty$, then: (i) if $\beta_1 > 1/2$ player 1 demands $x_1^* = 1/2$ which is always accepted and (ii) when $\beta_1 < 1/2$ she makes some demand $x_1^* \in [h(\overline{\alpha}, d), h(\underline{\alpha}, d)]$ which may be rejected by some high α_2-types.

The proof of Proposition 2 is relegated to Appendix A.1. Intuitively, the bazaar and the high-tech market lead to the same equilibrium predictions. The single substantive difference with Proposition 1 in Fehr and Schmidt

[1999, pp. 826f.] for the standard ultimatum game is the occurrence here of the lower acceptance threshold $l(\beta_2, d)$. If player 1 makes a very low demand, player 2 gets much more than player 1 when he accepts it. Player 2 does not find this unequal distribution attractive when his 'guilt'-parameter β_2 is high ($\beta_2 > 1 - d$) and therefore opts out after a very low demand. However, because $l(\beta_2, d) < 1/2$ this lower bound is irrelevant for the equilibrium outcome; player 1 always asks for at least an equal split.

The second part of Proposition 2 highlights the important case distinction between $\beta_1 > 1/2$ and $\beta_1 < 1/2$. In the former case player 1 really cares about advantageous inequality and prefers the equal split above any other possible distribution. Since the equal split is accepted by any α_2-type, she demands $x_1^* = 1/2$ in this case. When $\beta_1 < 1/2$ player 1 does not really care about advantageous inequality and she would like to make the largest demand player 2 is willing to accept given his 'envy'-parameter α_2, *i.e.* $x = h(\alpha_2, d)$. Because player 1 is incompletely informed about α_2, her equilibrium demand is in between the low demand $h(\overline{\alpha}, d)$ that is accepted by all α_2-types and the high demand $h(\underline{\alpha}, d)$ that is accepted by the least envious type of player 2 (*i.e.* $\alpha_2 = \underline{\alpha}$) only. Her equilibrium demand depends on her exact beliefs about the α_2-type distribution and her own β_1-type. But, importantly, it will always exceed the equal split demand.

In the second part of the experiment subjects had to formulate complete strategies of how to play the one-period game. We use these strategies to infer the (α^k,β^k)-parameters for each subject k. In line with the inequality-aversion model we assume that the (α^k,β^k) parameters do not vary with the role that subject k takes (*i.e.* player 1 or player 2). Then, as Proposition 2 makes clear, knowing a subject's acceptance threshold when she acts as responder allows one to infer her α^k-parameter precisely. No point estimates can be obtained for β^k, but the demand subject k makes as proposer (player 1) does reveal whether $\beta^k > 1/2$ or $\beta^k < 1/2$. In the former case the demand equals the equal split, in the latter it is necessarily higher.

We first look at proposer behavior in the strategy part. Irrespective of the value of D subject k is predicted to demand an equal split whenever $\beta^k > 1/2$. Only one subject consistently does so, all 79 others typically demand more.[12] This strongly suggests that the fraction of subjects with $\beta^k > 1/2$ is negligible. The same conclusion follows when we consider the one-

[12]For $D = 290$ there are three other subjects that demand (less than) half of the pie. However, when $D = 40$ these three do ask for more than an equal split.

period game data of part one. Of the overall 640 demands made 632 exceed the demand of 544, only 8 observations are at (or below) the equal split. These observations belong to 7 different individuals. For each individual subjects we have 8 observations, so observing a subject to demand an equal split only once or twice cannot be considered as evidence that $\beta^k > 1/2$. For the inferred values of $\hat{\beta}^k$ it thus holds that $\hat{\beta}^k < 1/2$ for (almost) all k.

Next we consider the subjects' strategies in the role of responders. Subjects could define up to three closed intervals of demands – for each value of D separately – and indicate their reaction to the demands that fall within these intervals (see section 3). 77 out of the 80 specified strategies correspond to the following format.[13] From a demand of zero up to some lower bound $H^k(D)$ all demands are accepted. Intermediate demands between $H^k(D)$ and $K^k(D)$ induces the responder to opt out. Higher demands that fall in the range $(K^k(D), 1000]$ are rejected. On average we observe $H(40) = 840$ and $K(40) = 951$, and $H(290) = 666$ and $K(290) = 950$, respectively.

The finding that low demands are always accepted is in line with our earlier observation that $\hat{\beta}^k < 1/2$ for (almost) all k; for $\beta_2 < 1/2$ the lower bound $l(\beta_2, d)$ derived in Proposition 2 equals zero. 74% of the subjects specified $K^k(D) = 1000$ for both values of D. These subjects act fully in line with the inequality-aversion model, which predicts that the responder always prefers to opt out rather than to forego the outside option payoffs. The remaining 26% display some reciprocal behavior. They choose to reject very high demands rather than to opt out. In that way they can (try to) punish the proposer for making a very unequal proposal. Reciprocity has its price though, because subjects are less willing to reciprocate when D is high: $K^k(40) < 1000$ for 17 subjects and $K^k(290) < 1000$ for 11 subjects.

The acceptance threshold $H^k(D)$ can be used to obtain an estimate of α^k. By assuming $0 \leq \alpha^k$ the inequality-aversion model requires $500 < H^k(D) \leq 1000 - D$. Two subjects specified a strategy in which for some D no demand was accepted, six subjects formulated a strategy that sometimes accepted any demand. For these eight subjects no sensible estimates of α^k can be obtained from $H^k(D)$. This also holds for the three responders that did not follow the strategy format described above. Overall 69 subjects remain. 30%

[13] Two subjects specified strategies that rejected low demands and accepted high demands. In both cases this seem to be clear mistakes, as the specified strategies are not consistent for the two different values of D. A third exception was a strategy that accepted low demands, rejected but did not opt out for intermediate demands, and opted out for high demands. In the subsequent analysis these three subjects are left out.

of them were completely selfish. They specified $H^k(D) = 1000 - D$ and $K^k(D) = 1000$.[14] The remaining 48 subjects revealed some concern for disadvantageous inequality. For them the estimate $\hat{\alpha}^k(D)$ equals:

$$\hat{\alpha}^k(D) = \frac{1000 - D - H^k(D)}{2 \cdot H^k(D) - 1000} \tag{2}$$

Table 7 provides information about the frequency distribution of $\hat{\alpha}^k(40)$, $\hat{\alpha}^k(290)$ and their average $\hat{\alpha}^k$ for the 48 fair types. Only 10% of them has an estimated $\hat{\alpha}^k$ above one half. Compared with earlier estimates reported in the literature (*e.g.* Goeree and Holt [2000] and Fehr and Schmidt [1999]), those obtained here are fairly small.

Table 7

Estimates of α^k for the 48 Fair Types

	Mean	St. error	Min.	Max.	$\# > \frac{1}{2}$
$\hat{\alpha}^k(40)$	0.388	0.331	0.074	1.77	13
$\hat{\alpha}^k(290)$	0.211	0.182	0	0.550	8
$\hat{\alpha}^k$	0.300	0.211	0.038	1.16	5

Remark: The last column gives the number of subjects for which the inferred value of $\hat{\alpha}^k$ is larger than 0.5.

Overall we conclude that there are fair types in our subject pool, but $\hat{\beta}^k < 1/2$ for (almost) all of them. There is no sign of having a significant fraction of 'super'-fair subjects with $\beta^k > 1/2$ in the population. Also the number of subjects with $\hat{\alpha}^k > 1/2$ is very limited. The percentage of purely selfish types figures around 30%.

5.2 Refined Predictions and Consistency Check

We finally turn to the question whether the inferred type distribution can explain the actually observed differences between the two-period bazaar and the two-period high-tech market. Like in Holt [1999] we are interested in whether a sparse specification of player types can already explain the main regularities, viz. Results 1 through 4. According to Fehr and Schmidt

[14] Here we actually allowed for some small $\epsilon = 10$ and considered subjects to be completely selfish whenever $950 \leq H^k(40) \leq 960$ and $700 \leq H^k(290) \leq 710$. Put differently, we treated subjects with an estimated $\hat{\alpha}^k < .018$ as having $\hat{\alpha}^k = 0$.

[2002] the most important heterogeneity is the one between purely selfish subjects and fair-minded subjects. We therefore confine ourselves to distributions with only two types: a fraction θ_s is completely selfish with $\alpha_s = \beta_s = 0$, the remaining fraction is fair with $\alpha_f \geq \beta_f$ and $0 < \beta_f < 1/2$. The latter restriction follows from our finding that the fraction of 'super'-fair types with $\beta^k > 1/2$ is negligible in our subject pool. Proposition 3 (partly) characterizes the predicted equilibrium outcomes. (The proof appears in Appendix A.1.)

Proposition 3 *Consider the two-period games with two-sided incomplete information in which a fraction θ_s is completely selfish with $\alpha_s = \beta_s = 0$ while the remaining fraction is fair with $\alpha_f \geq \beta_f$ and $0 < \beta_f < 1/2$. Let (with $h(\alpha_2, d)$ as defined in Proposition 2):*[15]

$$\pi(\alpha_1, \beta_2) \equiv \frac{1 + \alpha_1 - \beta_2}{3 + 4\alpha_1 - 2\beta_2} \quad \textit{and} \quad \Theta(\alpha_f, \beta_1, d) \equiv \frac{(1 - 2\beta_1) \cdot h(\alpha_f, d) + \beta_1 - d}{(1 - 2\beta_1) \cdot h(0, d) + \beta_1 - d}$$

High-tech market: (i) If $\theta_s < \Theta(\alpha_f, \beta_1, d)$ then $x_1^* = h(\alpha_f, d)$ which is accepted by both types of player 2. (ii) If $\theta_s > \Theta(\alpha_f, \beta_1, d)$ then $x_1^* = h(0, d) = 1 - d$. This demand is accepted when player 2 is of the selfish type, the fair type of player 2 opts out in response;

Bazaar: (i) If $d < \pi(\alpha_f, \beta_f)$, then the threat to delay agreement is strongest for both types of player 2 and the equilibrium outcome necessarily differs from the one of the high-tech market. (ii) If $d > \pi(\alpha_f, \beta_f)$ and $\theta_s < \Theta(\alpha_f, 0, d)$, then there exists an equilibrium that induces the same outcome as in the high-tech market.

Proposition 3 provides a full characterization of equilibrium outcomes only for the high-tech market. Player 1 chooses between the largest demand $h(\alpha_f, d)$ a fair player 2 is willing to accept and the largest demand $1 - d$ a selfish player 2 is willing to accept. Which of these two demands is actually chosen depends on the share θ_s of selfish types and on the type of player 1 herself. When the share θ_s exceeds the threshold $\Theta(\alpha_f, \beta_1, d)$, the higher demand $x_1^* = 1 - d$ is made. Because the threshold is type dependent, separating equilibria exist in which a fair player 1 demands less than a selfish player 1. However, for $\theta_s \leq 1/2$ the equilibrium is necessarily pooling and both player 1 types choose the lower demand $h(\alpha_f, d)$, which is always accepted.

[15] From $\alpha_i \geq \beta_i \geq 0$ it follows that $1/4 < \pi(\alpha_1, \beta_2) \leq 1/3 = \pi(0, 0)$. Moreover, $\Theta(\alpha_f, \beta_1, d) > 1/2$ and $\partial\Theta/\partial\beta_1 > 0$.

The threat to delay agreement remains effectively empty in the high-tech market. The presence of inequality-averse subjects does not affect this. The intuition here is as follows. Given that neither type cares much about advantageous inequality, player 1 knows that player 2 will demand – when given the opportunity in period 2 – at least the threshold amount $h(\alpha_f, d)$ a fair type player 1 is willing to accept. Hence continuation of the bargaining yields the fair type of player 1 a utility of d at the most. The fair player 1 therefore strictly prefers to opt out after a rejection of her demand, because this yields her a utility of $2d$. Anticipating this, player 2 knows for sure that player 1 is selfish when play reaches period 2. He then demands the maximum amount $1 - d$ a selfish player 1 is still willing to accept, yielding the latter a payoff d. Clearly, then also the selfish player 1 will opt out after rejection of her demand. The threat to delay agreement is therefore effectively empty for both types of player 2, because player 1 will always opt out after a rejection irrespective of her own type.

The above reasoning makes clear that the result is not restricted to two-type distributions (but it does depend on $\beta < 1/2$ for a sufficiently large fraction of the subjects). With more than two types the argument starts with the highest α_1-type player 1 can attain. This type can get at most d in period 2 and therefore always opts out in period 1 to obtain $2d$. Realizing this, player 2 will offer the second highest α_1-type at most a utility of d in period 2, and so on. This process resembles complete unraveling in a lemon's market. For the most fair type of player 1 it is best to withdraw from the period 2 bargaining beforehand when given the opportunity. As a result, second period demands will be higher, inducing also the second fairest types to withdraw *etc.* Because of this unraveling, the delay threat is empty in the high-tech market and the equilibrium outcome corresponds with the one of the one-period game (see Proposition 2).

In the bazaar player 1 cannot opt out after a rejection of her opening demand. Player 2 then effectively has both the delay and the opting out threat available, and which of these two threats is strongest depends on his beliefs about the type of player 1. These beliefs namely determine the expected utility player 2 can obtain from continuing the bargaining. The equilibrium analysis for the bazaar is therefore much more complicated, as player 1's demand now has important signaling value for player 2 about her type (see Fudenberg and Tirole [1983]). We therefore do not provide a full characterization of equilibrium outcomes, but focus instead on the question that is relevant for our purposes: Does the equilibrium outcome under the bazaar necessarily differ from the one under the high-tech market? The last part of Proposition 3 provides an answer to this question.

Under standard selfish preferences, the two bargaining games differ in their equilibrium outcomes when $d < 1/3$ and yield the same outcome for $d > 1/3$ (see Proposition 1). In the presence of inequality-aversion the threshold value of $1/3$ shifts downwards to $\pi(\alpha_f,\beta_f)$. There are two forces at work in the bazaar that explain this downward shift. First, compared to opting out the delay threat of the fair player 2 type is relatively weaker than the delay threat of the selfish player 2 type. This holds because delay results in an unequal distribution, which only the fair type dislikes to some extent. In order for both types of player 2 to prefer delay over opting out, we then need that the fair type prefers delay, *i.e.* $d < \pi(\cdot,\beta_f)$. The presence of fair player 2 types thus pulls the threshold value down compared to the case with only selfish types. Second, delay becomes less attractive for (both types of) player 2 in the presence of fair types of player 1. From selfish player 1's player 2 could demand $h(0, d)$ in period 2, from fair player 1's he can only ask for $h(\alpha_f, d)$. This provides the second downward pulling force.

If $d < \pi(\alpha_f,\beta_f)$ the delay threat is strongest even in the most stringent contingency where the fair type of player 2 is confronted with a fair player 1. The equilibrium opening demand of player 1 is then fully characterized by the threat to delay of player 2. In that case player 1 has less bargaining power and necessarily gets a lower expected payoff than in the high-tech market. Because opening demands depend on both the type of player 1 and the beliefs about the type of player 2, it does not follow that observed opening demands are necessarily lower in the bazaar. A sufficient condition for this is that $d < (1 - \alpha_f)/3$ (see the proof of Proposition 3).

When $d > \pi(\alpha_f,\beta_f)$ at least the fair type of player 2 may prefer opting out over delay. This depends on the fraction of selfish types in the population. For $\theta_s < \Theta(\alpha_f, 0, d)$ opting out is actually the strongest threat for both types of player 2. In that case an equilibrium exists in which the opening demand makes the fair player 2 indifferent between acceptance and opting out. This equilibrium outcome equals the one of the high-tech market, explaining part (ii) for the bazaar in Proposition 3.

Proposition 3 can provide a full explanation for our experimental findings when $\pi(\alpha_f,\beta_f) < 0.29$ holds. Recall that for $D = 290$ we observed that the two bargaining games did not differ in their outcomes. The experimental results suggested that for this level of the outside option the threat to delay agreement is also empty in the bazaar. According to the last part of Proposition 3 this requires that $\beta_f > 41/210$ and $\theta_s < 13/16$, assuming $\alpha_f = 0.3$ (see Table 7). The latter inequality is satisfied given that we have around 30% selfish subjects in our pool. The two restrictions together in fact require that there is a fraction of fair subjects exceeding 19% that prefers opting out over delay. Observed responder behavior reported in Table 5 suggests that this is likely to be the case. In 47% of the overall 32 cases in which the opening demand was not accepted, player 2 chose to opt out rather than to delay. For $D = 40$ Proposition 3 predicts that player 1 demands and gets more in the high-tech market than in the bazaar, in line with our experimental findings.[16]

We conclude that, once we take the presence of a significant fraction of inequality-averse subjects into account, the experimental results are in line with the (refined) theoretical predictions.

6 Conclusion

A characteristic feature of many real life negotiations is that the parties involved usually have an outside option to go elsewhere. In his theoretical analysis Shaked [1994] compares two different ways in which outside options can be incorporated in an alternating offer bargaining framework. The crucial difference concerns the *times* at which the outside option becomes available. In one situation, called the bazaar, outside options can only be taken up when responding to a proposal. Theory then predicts that the threat to delay agreement is not empty unless outside options are very attractive. In another situation labelled the high tech market, (also) the proposer can quit the bargaining immediately after her offer has been rejected. As a result, the responder's threat to delay is effectively empty, irrespective of the value of the outside option. The (first) proposer therefore obtains a larger equilibrium share in the high-tech market than in the bazaar. This paper presents an experiment to test this theoretical prediction.

In line with standard predictions based on pure income maximization, we find that the threat to delay agreement is effectively empty in the high-tech market. This is also the case in the bazaar when the outside option payoff is high, but not when it is low. As a result the two bargaining games differ in their outcomes only when the outside option is low. The bound on the

[16] As noted, obsverved opening demands are necessarily lower in the bazaar when the condition $d < (1 - \alpha_f)/3$ is met. For $D = 40$ this condition reduces to $\alpha_f < 0.88$. Our estimate of $\alpha_f \approx 0.3$ satisfies this.

outside option payoff below which this is the case appears to be lower than the one predicted by standard theory. This can be explained with a model of inequality-aversion. For fair types opting out is relatively more attractive than for completely selfish types. Their threshold value of the outside option payoff – above which they prefer to opt out rather than to delay – is therefore lower. When the outside option payoff is above this threshold and there is significant fraction of fair types in the population, the proposer's equilibrium demand makes the fair responder indifferent between accepting and opting out. In that case the two bargaining games are predicted to yield the same outcome, as is observed. In the high-tech market the exact preferences of the fair types appear to be decisive for the prevailing behavior in equilibrium. When there is an insignificant fraction of super-fair types that strictly prefer the equal split – as is the case for our subject pool – the delay threat is always effectively empty.

Overall we conclude that theory is right in pointing out the differences between the two bargaining games. First proposers sometimes do get significantly more in the high-tech market than in the bazaar. So, the exact timing of the opting out opportunities indeed matters in practice. Yet the precise circumstances under which this holds are highly dependent on the distribution of preferences within the population.

Appendix

A.1 Proofs of Propositions 2 and 3

Proof of Proposition 2 Owing to $U_i(d,d) = d > U_i(0,0) = 0$ non-acceptance always leads to the opting out outcome, because in the bazaar player 2 strictly prefers opting out over rejection while in the high-tech market player 1 strictly prefers Out over Reject (see Figure 2b). Note that in the high-tech market rejection is weakly dominated by opting out for player 2, so we assume that player 2 always chooses to opt out rather than to reject. Now if player 1 demands $x \leq 1/2$, accepting yields the responder $U_2(1-x,x) = 1-\beta_2 + x\,(2\beta_2 - 1)$. In case $\beta_2 < 1/2$ he therefore accepts whenever $x < ((1-d)-\beta_2)/(1-2\beta_2)$. Given $d < 1/2$ the r.h.s. exceeds $1/2$, such that the inequality is satisfied for any $x \leq 1/2$. When $\beta_2 > 1/2$ the responder certainly accepts if $x > (\beta_2 - (1-d))/(2\beta_2 - 1)$. The r.h.s. is always smaller than $1/2$ and negative when $\beta_2 < 1-d$, yielding the expression for $l(\beta_2, d)$. In case player 1 demands $x > 1/2$, acceptance yields player 2 a utility of $U_2(1-x, x) = 1+\alpha_2 - x(1+2\alpha_2)$. This exceeds d when $x < h(\alpha_2, d)$. From $d < 1/2$ it follows that $h(\alpha_2, d) > 1/2$.

Given the above reaction of player 2, player 1 will never demand $x < 1/2$, because $x = 1/2$ is always accepted and yields her strictly more. In case $\beta_1 > 1/2$ her payoff is decreasing in x for $x \geq 1/2$. She therefore demands the equal split $x_1^* = 1/2$. When $\beta_1 < 1/2$ player 1's utility increases with x. She then would like to make the largest demand player 2 is willing to accept, *i.e.* $x_1^* = h(\alpha_2, d)$, but she does not know the exact value of α_2. Given $\alpha_2 \leq \overline{\alpha}$, any demand below $h(\overline{\alpha}, d)$ is certainly going to be accepted. (Note that $h(\alpha_2, d)$ is decreasing in α_2.) So player 1 will demand at least $h(\overline{\alpha}, d)$. Also, given $\alpha_2 \geq \underline{\alpha}$, any demand above $h(\underline{\alpha}, d)$ is certainly going to be turned down. Hence player 1 will never demand more than $h(\underline{\alpha}, d)$. This yields that $x_1^* \in [h(\overline{\alpha}, d), h(\underline{\alpha}, d)]$. Her equilibrium demand x_1^* depends on her exact beliefs about α_2. Rejection of this demand occurs when $x_1^* \in (h(\overline{\alpha}, d), h(\underline{\alpha}, d))$ and $\alpha_2 > (1-d)/(2x_1^* - 1)$. For appropriately chosen type distributions this occurs with positive probability (for an example, see case (ii) of the high-tech market in Proposition 3). *Q.E.D.*

PROOF OF PROPOSITION 3 *High-tech market:* First consider the continuation game that starts in period 2. Let $v_2(x) \in [0, 1]$ denote the posterior belief of player 2 at the beginning of period 2 that player 1 is selfish, given that player 1 demanded x in the first period, player 2 rejected this and player 1 chose to continue. In the second period player 2 chooses between demand $y = h(a_f, d)$ and $y = h(0, d)$. The first demand is the largest one a fair type of player 1 is willing to accept, the second one the largest demand a selfish player 1 is willing to accept. It holds that $h(a_f, d) < h(0, d)$, so $y = h(a_f, d)$ is accepted by both types and $y = h(0, d)$ by the selfish type only. The former demand yields a utility of $[(1-2\beta_2) \cdot h(a_f, d) + \beta_2]$, the latter an expected utility of $v_2(x) \cdot [(1-2\beta_2) \cdot h(0, d) + \beta_2] + (1 - v_2(x)) \cdot d$. The first utility level is larger whenever

$$v_2(x) < \frac{(1-2\beta_2) \cdot h(\alpha_f, d) + \beta_2 - d}{(1-2\beta_2) \cdot h(0, d) + \beta_2 - d} \equiv \Theta(\alpha_f, \beta_2, d).$$

So, when $v_2(x) < \Theta(\alpha_f, \beta_2, d)$ we have $y_2^* = h(a_f, d)$ and $y_2^* = h(0, d)$ otherwise. This gives the PBE of the continuation game that starts in period 2. Importantly, player 2 will demand at least $y = h(\alpha_f, d)$ in period 2.

Next consider the continuation game that starts with player 1's decision whether to continue bargaining or not after her demand x has been rejected. Let $r_1(x) \in [0,1]$ denote player 1's posterior belief at this point that player 2 is selfish. Player 1 knows that player 2 will demand at least $h(\alpha_f, d)$ in period 2. When player 1 is of the fair type her utility is then at most d. With $d > 0$ this implies that the fair player 1 strictly prefers to opt out rather than to continue bargaining, because $2d > d$. So, would play ever reach period 2 on the equilibrium path, player 2 knows for sure that player 1 is selfish ($v_2(x) = 1$ on the equilibrium path) and he will demand $y_2^* = h(0, d)$. The selfish player 1 then gets a utility of d in period 2, and thus also strictly prefers to opt out in period 1. In sum, in the unique PBE-outcome of the continuation game that starts with player 1's continuation decision, player 1 always chooses to opt out irrespective of her belief $r_1(x) \in [0,1]$.

The above implies that when player 2 does not accept x, he always obtains a payoff of $2d$. (Note that for equal monetary payoffs the utility levels of a selfish and of a fair type player 2 are the same.) Player 1's decision which demand x to make is then fully equivalent to the demand decision in the one-period game; utility levels are only scaled upwards by a multiplicative factor of 2. From the above we immediately obtain that when $\theta_s < \Theta(\alpha_f, \beta_1, d)$ she chooses $x_1^* = h(a_f, d)$, and for $\theta_s > \Theta(\alpha_f, \beta_1, d)$ she demands $x_1^* = h(0, d)$.

Bazaar: (i) Let $q_2(x)$ denote player 2's posterior belief that player 1 is selfish after having demanded x. Player 2's own decision will not change his beliefs, so $v_2(x) = q_2(x)$ (with the beliefs $v_2(x)$ defined at the beginning of this proof). When $q_2(x) < \Theta(\alpha_f, \beta_2, d)$ player 2 would demand $y_2^* = h(a_f, d)$ in period 2. In that case player 2 prefers delay in period 1 over opting out whenever $(1-2\beta_2)\cdot h(\alpha_f, d)+\beta_2 > 2\cdot d$, *i.e.* whenever $d < \pi(\alpha_f, \beta_2)$. Because $\pi(\cdot,\cdot)$ is decreasing in both arguments, we have $\pi(\alpha_f, \beta_f) < \pi(\alpha_f, 0)$. So, for $d < \pi(\alpha_f, \beta_f)$ both types of player 2 prefer delay over opting out. Next, suppose $q_2(x) > \Theta(\alpha_f, \beta_2, d)$. Player 2 then would demand $y_2^* = h(0, d)$ in period 2. In period 1 he then prefers delay whenever $q_2(x) \cdot [(1 - 2\beta_2) \cdot h(0, d) + \beta_2] + (1 - q_2(x)) \cdot d > 2d$, *i.e.* when $q_2(x) \cdot [(1 - 2\beta_2) \cdot h(0, d) + \beta_2 - d] > d$. Given $q_2(x) > \Theta(\alpha_f, \beta_2, d)$ this inequality is certainly satisfied when $[(1 - 2\beta_2) \cdot h(\alpha_f, d) + \beta_2 - d] > d$. The latter restriction can be rewritten as $d < \pi(\alpha_f, \beta_2)$. Again, for $d < \pi(\alpha_f, \beta_f)$ both types of player 2 prefer delay over opting out.

For $d < \pi(\alpha_f, \beta_f)$ the largest demand a fair player 2 is willing to accept is strictly below $h(\alpha_f, d)$, the largest demand a selfish player 2 is willing to accept is strictly below $h(0, d)$. Also, would player 2 reject the demand, player 1 necessarily obtains a lower expected payoff than what she could get in the high-tech market after a rejection of her demand. Hence, the expected payoff for player 1 is necessarily lower than in the high-tech market. The largest demand a selfish player 2 is willing to accept in the bazaar satisfies $2(1-x) = h(\alpha_f, d)$; the r.h.s. gives the lowest utility that the selfish player 2 can obtain from delaying. This can be rewritten as $x = 1 - h(\alpha_f, d)/2$. Now, $1 - h(\alpha_f, d)/2 < h(\alpha_f, d)$ whenever $d < (1 - \alpha_f)/3$. In that case opening demands are always necessarily lower in the bazaar than in the high-tech market.

(ii) From part (i) it immediately follows that when $d > \pi(\alpha_f, \beta_f)$ the delay threat is not necessarily strongest for both types. We next show that it may be empty for both types of player 2, by providing the following PBE for the case $\theta_s < \Theta(\alpha_f, 0, d)$: both types of player 1 demand $x_1^* = h(\alpha_f, d)$, which both types of responder accept. Beliefs equal $q_2(x) = \theta_s$ for all demands x. (There are actually many out-of-equilibrium beliefs that support the equilibrium path.)

To show that this is a PBE, clearly player 1 never wants to deviate to lower demands $x < h(\alpha_f, d)$. Consider deviation to higher demands $x > h(\alpha_f, d)$. Given that $q_2(x) = \theta_s < \Theta(\alpha_f, 0, d)$ and thus $q_2(x) < \Theta(\alpha_f, \beta_2, d)$, the fair player 2 opts out in reaction to such a demand (recall that $d > \pi(\alpha_f, \beta_f)$). The selfish player 2 would possibly accept only when $x \leq h(0, d)$. Most profitable deviation is thus towards $h(0, d)$. This yields player 1 at most $\theta_s \cdot 2 \cdot [(1 - 2\beta_1) \cdot h(0, d) + \beta_1] + (1 - \theta_s) \cdot 2 \cdot d$. This falls short of $2 \cdot [(1 - 2\beta_1) \cdot h(\alpha_f, d) + \beta_1]$ whenever $\theta_s < \Theta(\alpha_f, \beta_1, d)$. So, player 1 does not want to deviate from demanding $x_1^* = h(\alpha_f, d)$. In response to equilibrium demand $h(\alpha_f, d)$, by the assumption on θ_s and d the fair player 2 is indifferent between accepting and opting out (see proof of part (i)). He thus has no strong incentive to deviate. Given $q_2(h(\alpha_f, d)) = \theta_s < \Theta(\alpha_f, 0, d)$, the selfish player 2 expects to obtain at most $h(\alpha_f, d)$ from delaying agreement. He thus prefers acceptance over delay whenever $2 \cdot (1 - h(\alpha_f, d)) \geq h(\alpha_f, d)$, *i.e.* whenever $1 - \alpha_f < 3d$ holds. From $\pi(\alpha_f, \beta_f) > (1 - \alpha_f)/3$ this requirement is already implied by $d > \pi(\alpha_f, \beta_f)$. By $h(\alpha_f, d) < h(0, d)$ he always prefers acceptance over opting out. So, also the selfish player 2 does not want to deviate. *Q.E.D.*

A.2 Instructions

Besides the on-screen instructions subjects also received a summary of these instructions on paper. Below a direct translation of this summary sheet is given. This summary belongs to the high-tech market with the upward order. The summary sheets for the other cases are similar. Subjects also received a schematic representation of the decision situation on paper. (The on-screen computer instructions explained the experiment with reference to this scheme.) The scheme for the high-tech market is reproduced in Figure 3.

A.2.1 Summary of the Instructions

This experiment consists of 32 rounds. At the start of each round the participants are paired in couples. This division into couples is chosen such that it is impossible that you are paired with the same other participant in two consecutive rounds. With whom you are paired within a particular round is always kept secret from you.

One of the participants within a pair has role A, the other has role B. What exactly your role is, you will hear at the beginning of each round. Over the rounds your role varies. This variation is such that you will be assigned the role of A in exactly half (16) of the total number of rounds (32), and the role of B in the other half. Moreover, it also holds that in every even round you are assigned the same role as in the directly preceding odd round.

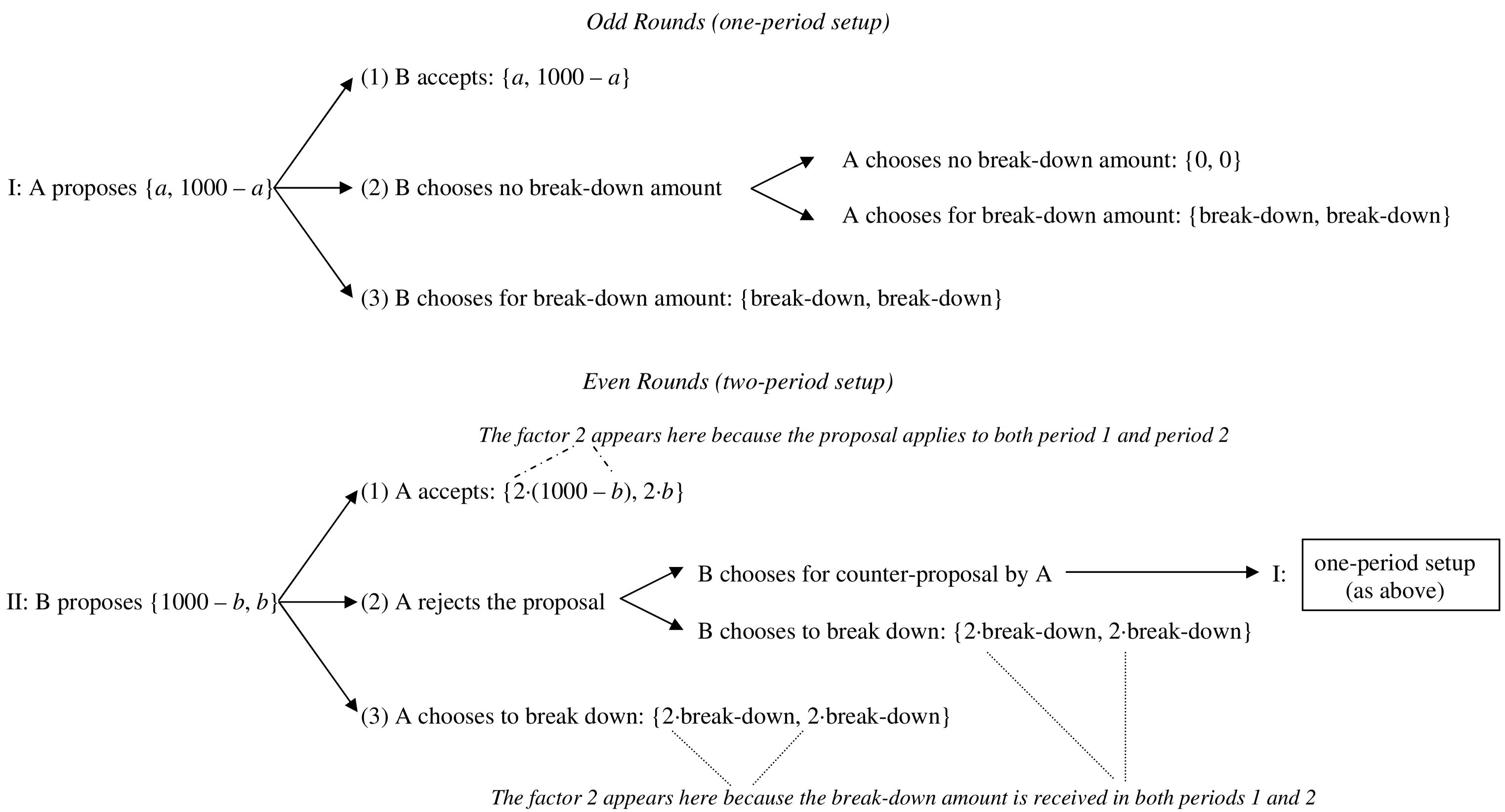
The setup of a round depends on its number. In odd rounds a round consists of one period, in even rounds the round consists of two periods. In each period there is an amount of 1000 points up for division between you and the participant with whom you are paired with.

Setup of an Odd Round. The participant with role A proposes a division of the 1000 available points. Participant B can react in three different ways:
(1) B can accept the proposal,
(2) B can reject the proposal and choose for no break-down amount, and
(3) B can reject the proposal and choose for the break-down amount.

In case B accepts the proposal, the round ends and A and B receive points according to the accepted proposal. If B chooses the second option above, participant A gets the opportunity to choose between the break-down amount or no break-down amount. When A chooses the break-down amount, both A and B receive the break-down amount that applies in that round. Also

Figure 3

Schematic Representation



$\{x, y\}$ = {number of points for A, number of points for B} when B chooses the third option above, both A and B receive the break-down amount.

Setup of an Even Round. An even round consists of two periods. In the first period participant B starts with formulating a proposal. Participant A can react in three different ways:

(1) A can accept the proposal,

(2) A can reject the proposal and possibly formulate a counter-proposal in the next period, and

(3) A can choose to break-down.

In the first case the 1000 points that are available in each of the two periods are divided according to the accepted proposal. If A chooses the second option, participant B chooses between allowing a counter-proposal by A or to break-down. When B chooses for allowing a counter-proposal, both A and B receive nothing in period 1. Subsequently, participant A makes a counter-proposal in period 2 about the division of the remaining 1000 points. The setup of this second period is the same as the one-period setup of an odd round. In case B chooses to break-down, the round ends and A and B receive the break-down amount that applies in both periods. This also applies when participant A chooses the third option above, *i.e.* to break-down.

The 32 rounds are divided into four blocks of eight rounds. In the first eight rounds and in the rounds 17 up to 24, the break-down amount equals 40 points. In the rounds 9 up to 16 and 25 up to 32 the break-down amount equals 290 points. Within each block of eight rounds you will never be paired with the same other participant in more than one round.

At the start of experiment you will get 5000 points for free. At end of the experiment you will be paid in guilders, based on the total number of points you earned. The conversion rate is such that 500 points in the experiment correspond to 1 guilder in money.

References

Avery, C., and P. Zemsky [1994], "Money Burning and Multiple Equilibria in Bargaining," *Games and Economic Behavior*, 7, 154–168.

BINMORE, K., J. MCCARTHY, G. PONTI, L. SAMUELSON, AND A. SHAKED [2002], "A Backward Induction Experiment," *Journal of Economic Theory*, 104, 48–88.

– –, P. MORGAN, A. SHAKED, AND J. SUTTON [1991], "Do People Exploit their Bargaining Power? An Experimental Study," *Games and Economic Behavior*, 3, 295–322.

– –, M. OSBORNE, AND A. RUBINSTEIN [1992], "Noncooperative Models of Bargaining," pp. 179–225 in: R. Aumann and S. Hart (eds.), *Handbook of Game Theory,* Elsevier Science Publishers: Amsterdam.

– –, A. SHAKED, AND J. SUTTON [1989], "An Outside Option Experiment," *Quarterly Journal of Economics*, 104, 753–770.

BOLTON, G., AND A. OCKENFELS [2000], "'ERC': A Theory of Equity, Reciprocity and Competition," *American Economic Review*, 90, 166–193.

CAMERER, C. [2003], *Behavioral Game Theory: Experiments in Strategic Interaction*, Princeton University Press: Princeton.

CHARNESS, G., AND M. RABIN [2002], "Understanding Social Preferences with Simple Tests," *Quarterly Journal of Economics*, 117, 817–869.

DUFWENBERG, M., AND G. KIRCHSTEIGER [2004], "A Theory of Sequential Reciprocity," *Games and Economic Behavior*, 47, 268–298.

FEHR, E., AND S. GÄCHTER [2000], "Fairness and Retaliation: The Economics of Reciprocity," *Journal of Economic Perspectives*, 14, 159–181.

– – AND K. SCHMIDT [1999], "A Theory of Fairness, Competition, and Cooperation," *Quarterly Journal of Economics*, 114, 817–868.

– – AND – – [2002], "Theories of Fairness and Reciprocity - Evidence and Economic Applications," pp. 208–257 in: M. Dewatripont, L. Hansen, and S. Turnovsky (eds.), *Advances in Economics and Econometrics - 8th World Congress, Econometric Society Monographs,* Cambridge University Press: Cambridge.

FUDENBERG, D., AND J. TIROLE [1983], "Sequential Bargaining with Incomplete Information," *Review of Economic Studies*, 50, 221–247.

Goeree, J., and C. Holt [2000], "Asymmetric Inequality Aversion and Noisy Behavior in Alternating-Offer Bargaining Games," *European Economic Review*, 44, 1079–1089.

Harrison, G., and K. McCabe [1992], "Testing Noncooperative Bargaining Theory in Experiments," pp. 137–169 in: R. Isaac (ed.), *Research in Experimental Economics,* vol. 5, JAI Press: Greenwich.

Holt, D. [1999], "An Empirical Model of Strategic Choice with an Application to Coordination Games," *Games and Economic Behavior*, 27, 86–105.

Kachelmeier, S., and K. Towry [2002], "Negotiated Transfer Pricing: Is Fairness Easier Said than Done?" *The Accounting Review*, 77, 571–593.

Kahn, L., and J. Murnighan [1993], "A General Experiment on Bargaining in Demand Games with Outside Options," *American Economic Review*, 83, 1260–1280.

Knez, M., and C. Camerer [1995], "Outside Options and social Comparison in Three-Player Ultimatum Games Experiments," *Games and Economic Behavior*, 10, 65–94.

Lopomo, G., and E. Ok [2001], "Bargaining, Interdependence, and the Rationality of Fair Division," *RAND Journal of Economics*, 32, 263–283.

MacLeod, W., and J. Malcomson [1995], "Contract Bargaining with Symmetric Information," *Canadian Journal of Economics*, 28, 336–367.

Muthoo, A. [1999], *Bargaining Theory with Applications*, Cambridge University Press: Cambridge.

Osborne, M. J., and A. Rubinstein [1990], *Bargaining and Markets*, Academic Press: San Diego.

Ponsati, C., and J. Sákovics [1998], "Rubinstein Bargaining with Two-Sided Outside Options," *Economic Theory*, 11, 667–672.

– – and – – [2001], "Randomly Available Outside Options in Bargaining," *Spanish Economic Review*, 3, 231–252.

ROTH, A. [1995], “Bargaining Experiments,” pp. 253–348 in: J. Kagel and A. Roth (eds.), *Handbook of Experimental Economics,* Princeton University Press: Princeton.

RUBINSTEIN, A. [1982], “Perfect Equilibrium in a Bargaining Model,” *Econometrica*, 50, 97–109.

SHAKED, A. [1994], “Opting Out: Bazaars versus ‘High Tech’ Markets,” *Investigaciones Económicas*, 18, 421–432.

SLOOF, R. [2004], “Finite Horizon Bargaining with Outside Options and Threat Points,” *Theory and Decision*, 57, 109–142.

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