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A General Experiment on Bargaining in Demand Games with Outside Options

Abstract

This experiment factorially combined the major independent variables from previous ultimatum and demand game experiments (discount factors, outside options, probability of termination, and who is the first mover), and thus provides a more general test of the behavioral predictions of the subgame perfect equilibrium model. The results yielded considerably more support than previous studies for the effects of equilibrium predictions, especially for the demands of players who had an outside option. Fair and equal outcomes were proposed rarely unless they were advantageous for the proposer. Instead, the results support the hypothesis that bargainers focused on a minimally acceptable offer, both in making their own demands and in considering the likelihood that the other party would accept their offer.

An elementary part of many two-party bargaining games, and the essence of the endgame, is the take-it-or-leave-it ultimatum. Guth, Schmittberger, and Schwarze (1982) were the first to systematically study bargaining behavior in ultimatum games. They found an unexpected result: Rather than offering the second party a very small amount, many of the first parties' proposals were near 50-50. Indeed, the strong game theoretic prediction, that the first party could ask for almost all of the prize, was clearly not supported.

Subsequent empirical research[1] has continued to document that, in a variety of situations, with a variety of variables, game theoretic equilibria are poor predictors of people's behavior in demand games. Even when the games are expanded to two or more periods, with offers alternating between the players, there appears to be a strong pull toward 50-50.

Ochs and Roth (1989) were the first to conduct a multiple-factor experiment of demand games, investigating two- and three-period games with four combinations of discount factors for the two players. Although this study, arguably the most comprehensive to date, generated a wide range of game theoretic predictions, only a small range of behavioral outcomes resulted, with mean first offers ranging between 50-50 and 60-40. In addition, their regression analyses found that changes in the equilibrium predictions had no significant impact on first offers. A third element of this paper, also damning for the predictions of the equilibrium models, was an analysis and review of counteroffers made following unpredicted rejections of first offers. In Guth et al., (1982), Binmore et al., (1985), Neelin et al., (1988), and Ochs and Roth (1989), rejection rates ranged between 15 and 20%. More disturbing is the observation that 65 to 81% of the counteroffers were disadvantageous: players typically demanded less than they had previously been offered.

This collection of results has generated considerable controversy, as Guth and his colleagues (Guth and Tietz, 1988) contend that "the game theoretic solution has nearly no predictive power." Binmore et al., (1985; 1989; 1991), on the other hand, claim more support for the game theoretic predictions. In their first experiment (Binmore, Shaked, and Sutton, 1985), the game theoretic prediction for the opening demand was 75 percent of the total to be divided. While inexperienced subjects had a modal offer of 50 percent, experienced subjects had a modal offer of 75%, as predicted. In another experiment (Binmore, Morgan, Shaked, and Sutton, 1991), results from four games led to outcomes that approximated but did not strictly support predictions.

Ochs and Roth's (1989) results replicated many of the disparate findings reported in previous research (including Binmore, et al., 1985; Neelin, Sonnenschein, and Spiegel, 1988; and Guth and Tietz, 1988), suggesting that game theoretic predictions might be supported in some conditions but not others. They concluded by suggesting that players may suffer disutility from accepting outcomes that they consider insultingly low. Thus, players may make counteroffers demanding a "respectable" share of a smaller total rather than accepting a low initial share. These speculations were augmented by a recent study by Bolton (1991), who found that bargainers acted as if they were negotiating over both absolute and relative outcomes. This concept is further amplified in research on "social utilities" by Loewenstein, Thompson, and Bazerman (1989).

Guth and Tietz (1990) also presented a general review, and concluded that a loose model, incorporating elements of fairness with equilibrium predictions, mapped the data observed thus far. In two-period games with a shrinking total, game theory predicts that the first player should demand a share that is roughly equal to 1-d, where d is the discount factor. A bargain based completely on considerations of fairness would result in a 50-50 split. Guth and Tietz (1990) found that as negotiators became more experienced, first round demands approached a compromise between these two extremes, demanding .75-.5d. One aspect of the experiment we report here tests this model.

The recent experiments of Binmore et al. (1989; 1991) investigated the effects of outside options in potentially infinite games. Rapoport, Weg, and Felsenthal (1990) also studied potentially infinite games, investigating the effects of variations in the costs of continuing for the two players (similar to discount rates in other studies). Results showed that, with experience, unequal cost functions generated increasingly extreme payoffs, as predicted.

Thus, four studies (Binmore et al., 1985, 1989, 1991; Rapoport et al., 1990) have provided some support for game theory's predictions. The two (Binmore et al., 1985; 1989) that investigated games with subgame perfect equilibrium near 50-50 led to bargaining outcomes varied around 50-50, and do not counter Guth and Tietz's (1987) contention that more extreme equilibrium predictions have received no empirical support. The other two studied infinite games.

The experiment reported here attempted to be more comprehensive in its scope. Our factorial design combined the four major independent variables that had been studied individually or in pairs in previous research. This provided for a more general test of game theory's behavioral predictions. Given the mixed support for the predictions of equilibrium models, our basic goal was to determine when they can accurately predict behavior in demand games.

The current study, like Binmore et al. (1989; 1991), included the possibility of an outside option as one independent variable. One of the players in half of these demand games could opt out for either 90% or 10% of the total payoff (which started at $10). In the other half of the games, one player would receive this same outcome if the game ended, but could not exercise this option unilaterally.

To increase generality, the games had probabilities of termination, p, of either .05 or .50. Games with p - .50 approximate one- and two-period ultimatum games; games with p - .05 approximate the infinitely repeated game (e.g., Rapoport, et al., 1990).

We also manipulated discount factors, allowing the prize money to shrink by 20% after each period in half of the games (d - .8); in the other half, the prize money remained the same, with d - 1.

The variables in this study contribute to a set of predictions that span a considerable range: one player or the other should demand anywhere from 5 to 97% of the payoff (see Table 1). This provided an opportunity to test whether subgame perfect equilibrium predictions might be supported only when they are near 50-50, or whether extreme predictions might also be supported when outside options were available.

A final element in the design was repeated play, which provided for a test of the effects of experience. Although Ochs and Roth (1989) and Bolton (1991) did not find strong effects for experience, Binmore et al.'s (1985) proposition that experience is important warrants additional testing.

The game theoretic predictions for this experiment follow Rubinstein (1982), who addressed the general case, and Binmore, Rubinstein and Wolinsky (1986), who addressed the infinite horizon case where one party can opt out and collect a guaranteed payment of, say, x. While this right appears to give that party an advantage, Binmore et. al (1986) show that such an option influences the equilibrium only if x > the equilibrium prediction where the option does not apply. For example, in an infinite game where the parties can divide \$10 that does not get discounted over time, the Nash cooperative solution is a \$5-\$5 split. This prediction holds when either party has the right to opt out for $x \leq \$5$. Then the opt out threat is not credible, since the predicted outcome exceeds x. Outside options only serve as constraints on agreements. If $x > \$5$, then the equilibrium prediction gives the option player x (the "deal me out" solution; Binmore, et al., 1991) and the opponent receives the remainder.

Experimental Design

Our experiment used a 2 x 2 x 2 x 2 x 2 design (see Table 1). We manipulated: a) two discount factors, d = 1 or d = .8; b) two probabilities of termination conditional on a rejected offer, p = .05 or p = .5; c) player 2's outside option, s = 10% or 90% of the total currently available for negotiation; d) the presence or absence of the option player's right to unilaterally opt out of the negotiations; and e) which player was the first mover. Players experienced games with both outside options and alternated who was the first mover in their repeated negotiations. Thus, first mover and outside options were repeated variables; discount rates, the probability of termination, and the right to opt out (or not) were between factor variables. The parties started bargaining over \$10 in each case.

To illustrate, consider the treatment with d = .8, p = .05, s = 10%, and where the option player, player 2, cannot opt out and player 1 makes the first offer. Player 2 can either accept or reject this offer. If player 2 rejects, then a 5% random draw determines whether the negotiations continue. If the 5% chance comes up, the negotiations end, and player 2 receives 10% of \$10, or \$1, while player 1 receives nothing. If the 5% chance does not come up, the total to be divided and the outside option shrink to $8 and 80 cents, respectively. Player 2 now makes the next offer. The negotiations continue with the players alternating offers until a breakdown or an agreement. When player 2s had the right to opt out, they could exercise it anytime, rather than proposing or responding to an offer. When d = .8 and s = 90%, player 2s tended to opt out before the second round of offers (when their option would also shrink by a factor of .8). Thus, player 2s often opted out rather than either accepting or rejecting a poor offer; they also opted out rather than making an offer and risking a rejection.

In the Appendix, we compute the subgame perfect equilibrium outcomes for each condition, displayed in Table 1. Several features of these predictions are worth noting. First, initial movers are predicted to have an advantage, which is most pronounced when s = 10%, p = .5, and d = .8, although it is nearly as large when d = 1. When p is .5, the game resembles an ultimatum game and a 10% outside option should pose almost no constraint on the outcome.

Second, with a positive p, the outside option should be an advantage, even when s = 10% (Binmore et al. 1986). Of course s = 90% should provide an even bigger advantage.

Third, when d = 1, the right to opt out should not matter: a player can wait with no cost (other than time and the effort of rejecting offers) until a breakdown to get s. Player 2s can guarantee themselves the outside option, even without the right to opt out. Alternatively, when d = .8, the right to opt out for a 90% option obviates the possibility of having to wait for a potentially smaller payoff at breakdown.

Fourth, since the 10% option is generally not credible, the right to exercise it should not matter. However, the status quo wealth of the player with the 10% option includes the expected value of the option in the event of a breakdown. Thus, the existence of the option should influence the outcome, in contrast to models with no chance of breakdown (Binmore, Rubinstein and Wolinsky, 1986).

Fifth, reducing d from 1 to .8 should not always favor first movers. For example, with no right to opt out and s = 90%, the option player should do better with d = 1 since waiting for a breakdown is worth less when d = .8. This difference should be especially pronounced when p = .05. On the other hand, when s = 10%, d = .8 should give the first mover a larger advantage than otherwise--a condition resembling finite demand games without outside options.

<u>Procedure</u>

Participants in the experiment were undergraduates (typically juniors and seniors) in marketing and management classes who volunteered for monetary prizes that depended on their performance as well as a small, fixed amount of extra course credit (a long standing norm in these courses). Groups of six to sixteen individuals participated in a session. Participants were randomly assigned to be player 1s or player 2s. Player 2s had an outside option for every game; player 1s never did. Player 1s and 2s sat on opposite sides of a large classroom, facing away from each other. Players were monitored to insure that no one knew the person with whom they were bargaining.

Sessions began with a series of practice games, where a fictitious $2 was divided. Player 2s' outside options in the practice games were 60% of the money available (starting at $1.20). Player 2s who could opt out in the experimental games could also opt out in the practice games.

For the practice games d was .9 and p was .01. Players responded to a series of hypothetical first offers and made a series of first- and second-period demands (which were based on the assumption that they may have rejected a first-period offer).

They then proceeded to the "money" sessions, where they were told that one game would be randomly selected to determine how much money they would actually receive. They were encouraged to do as well as they could on each negotiation, as they wouldn't know which game would determine their monetary outcome until the end of the experiment.

They were told that they would negotiate with a different player each game. (In sessions with many games and/or few players, bargainers sometimes negotiated with the same opponent more than once. No one, however, negotiated with the same person on consecutive games.)

The games always started with a division of $10. Games ended with the acceptance of an offer, player 2 opting out, or the game terminating. The probability of termination was kept constant within each game, at either .50 or .05. We flipped a coin after each period to determine whether the game would continue in the .50 condition. We randomly selected a chip from a dish that contained 19 white chips and one green chip to determine whether the game would continue in the .05 condition: selection of a white chip meant the game continued; selection of a green chip meant the end. All of the information in the experiment was shared and common knowledge.

For any single game d and p remained fixed across games; participants were reminded of them prior to each game. The value of the outside option (starting at $1 or $9) and who made the first offer (player 1 or 2) rotated every game and was noted in the instructions before each game. The effects of d on the payoff and the outside option were displayed before each game; their shrinkage was announced prior to each round of each game. Player 1s made the first offer in the odd-numbered games, player 2s in the even-numbered games.

The outside option started at $1 in games 1, 2, 5, 6, 9, 10, 13, 14, 17, and 18, and $9 in games 3, 4, 7, 8, 11, 12, 15, and 16. Experimental sessions included from 4 to 18 games. This was not known prior to play. Thus, although each game was terminated with a fixed probability, the sessions were terminated approximately one half hour before the experiment's advertised termination point. The end was announced only after the last game was completed.

Players making offers filled out offer slips that were collected and delivered to the appropriate player by the experimenters. Players receiving offers could accept or reject them. Players who had the opportunity to opt out could do so at any time. Players were told whether their offer was accepted or rejected or whether the other player had opted out. If the game continued, the other player made the next offer, dividing an amount reduced by 20% if d was .8.

A lottery at the end of each experimental session selected the game that determined their monetary payoffs. Participants completed a short post-experimental questionnaire and were paid their winnings. Any questions about the experiment were answered. Subjects were asked not to reveal details about the study to others, and could request a final report of the results at the end of the experiment.

Results

The results will be presented in several sections in an attempt to comprehensively depict the bargaining process. The first section is an overview of the main effects and interactions of the variables manipulated in the study. The second section presents a series of sharp tests of the equilibrium predictions. The third presents the effects of equilibrium predictions on opening demands. The fourth analyzes the effects of experience. The fifth describes the frequencies of agreements, breakdowns, and choices to opt out. The sixth checks for a possible first mover advantage. The seventh and eighth address 50-50 proposals and disadvantageous offers and counteroffers. The last section describes the success of different bargaining strategies.

Overall Analyses

As shown in Table 2, opening demands (as well as demands over all rounds, which were very similar) were significantly different from predictions in 23 of 32 cases [$p < .05$, two-tailed]. Eight of the nine remaining cases occurred when s = 10%, where predictions were closer to 50-50. When s was 90%, player 2s who could opt out frequently made opening demands of 90%. They seemed reluctant to ask for more, even though equilibrium predictions suggest that they should. Their behavior reflected the "deal me out" solution (Binmore, et al., 1989). At the same time, these demands were much more extreme than those observed in previous demand game experiments.

An analysis of variance of the deviations of first demands from equilibrium predictions included the five independent variables (player 1 or 2; p = .05 or .5; d = .8 or 1; s = 10% or 90%; and whether the player with the option could opt out) in a fully saturated model. Main effects resulted for each of the variables except whether the player with the option could opt out.

Player 2s, who had the option, consistently demanded less than predicted (-.075); player 1s demanded more (.151), especially when s was 90% (.25; see Table 3). When s was 10%, demands were close to but just less than predicted (-.025). No shrinkage of the payoffs (d = 1) led to higher demands than predicted (.069); when d was .8, demands were near equilibrium (.006).

Finally, when p was .05 demands exceeded equilibrium predictions (.065), while p = .50 led to near-equilibrium demands, on average (.013).

Many interactions were significant, the most comprehensive being a four-way interaction that included all the of the variables except p (see Table 3). Most of the means in Table 3 are significantly different from zero (i.e., the prediction). As noted, player 2s demanded less than predicted. Player 1s demanded more when d was 1 or, particularly, when s was 90%. This effect was accentuated (.470) when player 2s could not opt out and the payoff didn't shrink (d = 1)--here, player 1s' demands were near or greater than 50-50 (see Table 2). Clearly, player 1s were particularly resistant to offering most of the payoff to player 2s, even when a breakdown meant nothing for them and 90% for player 2.

Tests of Equilibrium Predictions

The equilibrium model predicted that the right to opt out should not matter for s = 10% as threats are not credible (Binmore, Rubinstein and Wolinsky, 1986). This hypothesis cannot be rejected in seven of the eight possible comparisons. Further, the equality hypotheses cannot be rejected when they were tested jointly. Specifically, we regressed the opening demand (DEMAND) on d, p, p*d, and a dummy variable for whether player 2 had the right to opt out (OPT), separately for each player when s was 10%. The effect of the right to opt out was .024 (t[133] = 1.100) for player 1s and -.004 (t[114] = -.192) for player 2s, not significant in either case. These results provide some support for the game theoretic predictions.

The equilibrium model also predicts that the right to opt out should not matter when d = 1 since player 2 can simply wait for a breakdown to collect the option. We tested this hypothesis by regressing opening demand on p, a dummy variable for the 90% option of (HIGH), p*HIGH, and OPT, separately for each player in the d = 1 conditions. The OPT results were -.139 (t[126] = -3.84, p < .001) for player 1s' opening demand and .039 (t[122] = 1.99, p < .05) for player 2s', rejecting the prediction. Further stratification indicated that these restrictions were accepted when s was .10 but not .90. Specifically, for player 1s (with d = 1 and s = .10), the effect of OPT (controlling for p) on opening demands was -.011 (t[61] = -.32); when s was .90, the effect of OPT on player 1s was -.26 (t[64] = -4.47, p < .001). For player 2s, s = .10, and d = 1, the effect of OPT was -.019 (t[57] = -.72); when s was 90% it was .094 (t[64] = 3.44, p = .001).

The final equality test concerns player 1's demands when player 2s can opt out for a 90% option and d = .8. Here p should not affect player 1's demand, since player 2 can opt out if player 1 offers less than 90%. The equality prediction cannot be rejected [t(27) = -.46]. However, in each case player 1s' average offers were only 71-75% of the total (i.e., they demanded 25-29%; see Table 2). Evidently, player 1s would rather have had player 2s opt out than make offers of 90% or more. Also, when s = 90% and d = 1, the right to opt out led to player 1s being less aggressive and player 2s more aggressive, acknowledging player 2s' bargaining power (Table 3). Nevertheless, player 1s still asked for more than predicted and player 2s asked for less. In particular, the players apparently underpredicted the likelihood of a breakdown if they kept rejecting each other's offers. Such myopic behavior may be similar to that observed in Neelin, et al., (1988).

<u>Effect of Equilibrium on Opening Demands</u>

Although the results reported above provide only partial support for the equilibrium predictions, regression analyses show a strong relationship between predictions and demands. When we regressed opening demands (DEMAND) on equilibrium demands (EQ) for the pooled sample, we obtained the following results:

1) DEMAND = .296 + .545*EQ.
(.016) (.025)

suggesting that predictions significantly (but not completely) affected demands, [$t(507) = 22.06$, $p < .001$]. The full sample results also show that player 2s responded much more to equilibrium than player 1s. When we interacted EQ with PLAYER (i.e., a variable equalling 1 for player 2), we obtained

2) DEMAND = .326 + .493*EQ - .305*PLAYER + .385*EQ*PLAYER.
(.018) (.041) (.054) (.076)

A one unit change in the predicted demand was associated with a change in player 1's opening demand of .493 [$t(504) = 12.09$, $p < .01$]; however, a one unit change for player 2 was associated with a change of .879 [$t(504) = 13.71$, $p < .01$]. Further, the player-equilibrium interaction term was highly significant [$t(506) = 5.07$, $p < .01$], indicating that player 2s responded more strongly to equilibrium than player 1s.

We investigated the strong pull of equilibrium predictions further by stratifying the regression sample by the outside option conditions. The findings were striking:

<u>Option = 10%</u>

3) DEMAND = .658 - .072*EQ - .086PLAYER + .079*EQ*PLAYER.
(.085) (.147) (.127) (.206)

<u>Option = 90%</u>

4) DEMAND = .327 + .413*EQ - .407*PLAYER + .590*EQ*PLAYER.
(.024) (.131) (.157) (.214)

Equilibrium predictions were significantly related to opening demands only when s was 90%: For player 1s, the effect of a one unit change in the equilibrium predictions on opening demands was .413 [$t(248) = 3.16$, $p < .01$]; for player 2s, the change in opening demands was 1.00 [$t(248) = 5.93$, $p < .01$]. When s was 10%, changes in the equilibrium predictions led to non-significant, near zero effects for both players: For player 1s, the change was -.072 [$t(253) = -.492$)]; for player 2s, it was .007 [($t(253) = .046$)].

Thus, when the outside option was 90%, and 13 of 16 conditions predict opening offers greater than .90 for player 2s, first offers moved with the predictions for both players, particularly player 2s. The other three conditions led to serious drops in the offers to or demands of player 2s, as predicted. Player 1s were also consistent, offering less than predicted, and much less than predicted when d was 1 and player 2 could not opt out. When the option was 10%, however, and the predictions more closely approximated 50-50, the effects of the predictions yielded nonsignificant regressions, even though the mean outcomes in these conditions were not significantly different from predictions half of the time (see Table 2).

<u>Effects of Experience on Behavior</u>

As noted, previous experiments found that players' behavior converged toward equilibrium (Binmore, et. al, 1985) or toward the average of the equilibrium prediction and a 50-50 split (Guth and Tietz, 1990) with experience. Table 4 shows regression results for the effects of experience on opening demands. Player 2s were more affected by experience than Player 1s, whose opening demands and responsiveness to equilibrium predictions were not significantly affected by experience. Controlling for equilibrium, more experienced player 2s' demands became significantly more conservative

[$t(501) = -2.70$, $p < .01$]; their opening demands were also more responsive to equilibrium predictions [$t(501) = 1.96$, $p < .05$].

The effects of experience can also be used to evaluate Guth and Tietz' (1990) conjecture that behavior in demand games converges toward a simple average of the game-theoretic equilibrium and a 50-50 split. In this experiment, this conjecture implies the following relationship between actual opening demands and equilibrium opening demands:

5) $$\text{DEMAND} = .25 + .5*\text{EQ}.$$

Based on the interaction model in Table 4, the data exhibit following relationships between actual and equilibrium behavior:

<u>Player 1</u>

6) $$\underset{(.031)}{\text{DEMAND} = .351} \; - \underset{(.005)}{.005*\text{SESSION}} + \underset{(.072)}{.457*\text{EQ}} + \underset{(.011)}{.007*\text{SESSION}*\text{EQ}}$$

<u>Player 2</u>

7) $$\underset{(.095)}{\text{DEMAND} = .204} \; - \underset{(.014)}{.032*\text{SESSION}} + \underset{(.122)}{.682*\text{EQ}} + \underset{(.018)}{.034*\text{SESSION}*\text{EQ}}.$$

According to equations 6) and 7), player 1s began the first session with demands that were quite distant from the equilibrium prediction and more in their own favor. The shift term in their opening demands is .346, which is significantly greater than .25 [$t(501) = 3.49$, $p < .01$]; however, while the impact of equilibrium was .464, which is less than .5, this difference is not significant [$t(501) = -.56$]. In contrast to those without outside options, player 2s began with demands toward the equilibrium side (which is also favorable to them). For them, the shift term is .172, which is smaller than .25, though not significantly so [$t(501) = -.93$]; but the impact of equilibrium is .717, which is significantly greater than .5 [$t(501) = 2.02$, $p < .05$].

As play progressed, player 1s' opening demands approached the Guth and Tietz (1990) compromise between 50-50 and equilibrium, while player 2s' moved toward equilibrium only when the predictions were quite high. For example, in the seventh session, the following relationships between actual and equilibrium demands resulted:

<u>Player 1s' Predicted Demands in the Seventh Session</u>[2]

$$\text{8)}\quad \text{DEMAND} = \underset{(.020)}{.318} + \underset{(.045)}{.505}{*}\text{EQ}$$

<u>Player 2s' Predicted Demands in the Seventh Session</u>

$$\text{9)}\quad \text{DEMAND} = \underset{(.054)}{-.021} + \underset{(.067)}{.924}{*}\text{EQ}.$$

Equation 8 shows that in the seventh session, the shift term for player 1s was close to, but significantly different from .25 [t(501) = 3.45, $p < .01$]; and the effect of equilibrium was almost exactly .5. For player 2s (equation 9), the shift term was not significantly different from zero [t(501) = -.39], and the effect of equilibrium was not significantly different from 1 [t(501) = -1.14].[3]

Equations 7 and 9 reveal that when Player 2's equilibrium demand was over 93% (a condition met in several games), predicted demands rose with experience, but only slightly. They were never close to the extreme equilibrium predictions. For example, when the equilibrium demand was 97% (the maximum in our experiment), equation 7 predicts an opening demand for Player 2 of 87% in the first session. By the 20th round (just outside the range of our experiment), it predicts an opening demand of 89%. Thus, while equation 9 supports equilibrium predictions, convergence toward equilibrium is slow. This analysis suggests that the equilibrium predictions, at least on the part of the player with the high option, both lingered and exerted strong pulls.

Agreements, Breakdowns, and Choices to Opt Out

While we have already discussed some effects of the discount factor, an additional prediction related to the strike literature is that shrinking outcomes should induce more agreements than fixed outcomes (Reder and Neumann, 1980; Forsythe, Kennan and Sopher, 1991). This prediction is based on the notion of disagreement costs. Even though game theory predicts immediate agreement, computational costs may be associated with reaching it. The greater the costs of disagreeing, the more incentive the parties have to overcome these complicated barriers. When the likelihood that an interaction ended in agreement (rather than breakdown or opting out) was analyzed using probit analysis, d had a significant negative effect on the incidence of agreements ($p < .05$, two-tailed test) when player 2 could not opt out[4], supporting the efficiency argument. In addition, there was a significant ($p < .01$, two-tailed test) positive experience effect on the likelihood of avoiding breakdown.

However, when player 2 had the right to opt out, d had a significantly positive ($p < .05$, two-tailed test) effect on the probability that the interaction avoided breakdown. As Table 5 shows, when s = 90%, d = .8, and player 2 could opt out, player 2's opted out of 56-60% of the negotiations. Many player 2s took the sure 90% early (before it shrank) rather than risk a rejection by player 1s.

Also notable in Table 5 is the high incidence of breakdowns (61-65%) when player 2 could not opt out, s = 90%, and p = .5. Player 1s' demands were at or above 50% in these conditions; player 2s' were near 90%. Not surprisingly, few proposals were accepted.

The First Mover Advantage

The equilibrium model predicts a higher payoff when a bargainer made the first offer. We regressed, separately for players 1 and 2, the final money outcome on a first mover status dummy variable and dummy variables for treatment conditions. For player 2s, the impact of moving first, all else equal, was $.162 (t[490] = 1.457); for player 1s, it was $.074 (t[490] = .561). In addition to not being significant, the magnitudes of these estimates are small in comparison to the average dollar outcomes of $6.14 (Player 2) and $2.78 (Player 1), and to the average predicted first mover advantage of $1.30. Although we found little support for the predicted first mover advantage, it should have been less in a game with probabilistic endpoints than in, say, a one period demand game.

Focal Points: 50-50 and 90-10 Splits

As noted, player 1s' demands departed significantly from the equilibrium predictions and toward 50-50 splits when s was 90%. Table 6 presents the frequency of 50-50 opening offers. When p = .05 and s = 10%, 50-50 approximates the equilibrium prediction, and proposals of even splits were frequent (n = 50/126; 39.7%). However, player 1s demanded 50-50 splits just as often (n = 13/30; 43.3%) when s was 90% and player 2 couldn't opt out. Such behavior emphasizes the 50-50 split's impact as a focal point. However, when player 2 could opt out for 90%, player 1's demands for 50-50 were much less frequent (n = 5/61; 8.2%). Not surprisingly, when player 2s could opt out or wait for a 90% outcome, they also made few 50-50 offers (n = 3/102; 2.9%). This suggests that fairness, defined as equal outcomes, was not a consistent concern in these games.

We also investigated the prevalence of 90-10 as a focal point. When player 2s could opt out for 90%, player 1s offered 10-90 splits 30 times in 96 opportunities (31%, with a range from 21 to 41% in the four conditions). This suggests that the 10-90 demand is a focal point that was used at approximately the same rate whether it was an equilibrium prediction or not. Alternatively, when player 2 could not opt out but had an outside option of 90%, only one player 1 offered 10-90 (in 148 opportunities).

A 90-10 split is never the equilibrium demand for player 2 (see Table 1). Player 2s opted out the majority of the time when their option was 90% and d was 0.8. When they didn't opt out, player 2s proposed a 90-10 split 31.5% (23 of 77) of the time (across all values of d and p)--about as often as player 1s. Also like player 1s, they demanded 90-10 significantly less--only 12.0% of the time ($p < .01$)--when they could not opt out but would still receive 90% in the event of a breakdown. Thus, both parties made 90-10 offers primarily when player 2s could opt out for 90%.

Disadvantageous Counteroffers

Disadvantageous moves could occur in three ways in this experiment. First, as in previous studies, a player might make disadvantageous counteroffers. Second, player 2s might make disadvantageous offers, demanding less than their exercisable outside option. Third, player 2s might accept disadvantageous offers that were less than their outside option.

Each of these behaviors was rare. A total of 914 moves (offers or decisions to opt out) led to 433 rejections; only 14 (3.2%) counteroffers were disadvantageous. Three times such behavior could be considered altruistic, as the rejecting party offered the opponent more money than s/he had just requested.

Second, in seven of 219 cases (3.2%), Player 2s demanded less than the outside option when they could opt out. These all occurred, not surprisingly, in the 96 cases (7.3%) where the option was 90%. Third, disadvantageous acceptances occurred in only 3 of 231 cases (1.3%), all in the s = 90%, d = 1, right to opt out condition (n = 46; 6.5%). Clearly, altruistic behavior and disadvantageous counteroffers were relatively rare.

<u>Effect of Player Decisions on Outcomes</u>

More aggressive demands might bluff an opponent into making more conservative counteroffers. However, since a higher demand increases the chances of rejection, such a strategy may increase the chances of a breakdown or opting out.

To estimate the impact of aggressive offers on outcomes, we regressed the eventual payoff of the first mover (run separately for player 1s and player 2s) on first round demands and dummy variables for the experimental treatments (e.g. p = .05, d = 1, option = 90%, and player 2 can opt out). For player 1s, the effect of an increase in the first round demand on the final outcome was -.176 [t(247) = -3.24, p < .01]; for player 2s, the corresponding effect was .088 [t(203) = .99, ns].[5] Thus, moves toward equal splits led to smaller payoffs for player 1s; more aggressive demands by player 2s had little effect on their final payoffs.

For games that continued after a rejected offer, we examined the impact of the size of the rejected offer on the counteroffer. The effects were small and not significant, indicating that bluffing did not improve an opponent's counteroffer, and may have led to more breakdowns or opting out by player 2s. Thus player 1's attempts to avoid small outcomes resulted in dollar losses.

The pattern of accepted offers (Table 7) is similar to that for rejected offers. When player 2 had no right to opt out and s was 90%, player 1 averaged well above the equilibrium outcome. But when player 2s could opt out for 90%, player 1's accepted demands averaged .09-.10.[6]

Conclusions

The most noteworthy result in this study was the effect of outside options: Unlike previous demand game experiments, the presence of high outside options for one player pushed bargainers' demands far from 50-50 proposals. At the same time, however, behavior was significantly different from equilibrium predictions. Binmore, et al. (1991) reported similar results for a smaller set of games and a less comprehensive set of experimental conditions.

Players with high, exercisable outside options often opted out. When they didn't, their demands rarely exceeded the value of their outside option, even though equilibrium predictions suggested that they should. Psychological theories of equity (e.g., Adams, 1963) suggest that people are intolerant of relative overcompensation and, particularly, relative undercompensation. These results indicate that players with high options may have been somewhat uncomfortable asking for more than their option, which might already be perceived to be relative overcompensation. At the same time, however, they may have feared that their offers would be rejected. Players who could exercise high outside options did so, however, and didn't underplay their hand as much as player 2s who had the high outside option but couldn't opt out. This suggests that fear of rejection may have been more influential than inequity.

Players without outside options resisted the weakness of their bargaining positions. Player 1s offered more when player 2s had high exercisable options, but their average offers still fell around 70%--much less than the 90% option. When player 2s could not opt out, player 1s demanded about 50% of the payoff--far more than predicted. These results all provide support for Ochs and Roth's (1989) notions of a minimum acceptable outcome. Guth and Tietz's (1990) model (for players without outside options), Bolton's (1991) model of relative outcomes, and psychological models of equity. At the same time, equilibrium predictions were influential, particularly for player 2s, in raising demands.

One alternative explanation for these findings, also pursued by Bolton (1991) is that players (like ours) who experienced multiple equilibria would be more responsive to those different equilibria. The underlying rationale is that seeing situations with markedly different strategic opportunities may clarify the value of those opportunities. This was not the case here: Every experimental session and every group of participants provided data that supported the equilibrium prediction in some conditions and not others. Bolton (1991) also found mixed evidence for the experience hypothesis. Thus, we conclude, as did Bolton (1991), that the experience of multiple equilibria does not explain these results.

While the existence of an outside option may explain why equilibrium has some explanatory power in our results and in Binmore et al. (1989; 1991), game theoretic predictions have been rejected in other experiments with option-like characteristics. Hoffman and Spitzer (1982 and 1985) presented bargaining pairs with three alternative allocations of payoffs, each with a different total dollar value. One player (the "controller") could unilaterally choose among the allocations; however, the parties were also free to make binding contracts, and side payments were allowed. The controller was analogous to a player in our games who had the right to opt out.

Hoffman and Spitzer (1982) found that parties almost always chose the allocation with the highest total value (the Pareto optimal choice) with a majority splitting the money equally, despite the controller's ability to choose the allocation. The fact that bargaining in their experiments was face-to-face and parties made written contracts with side payments may have contributed to the 50-50 splits.

In a related study, Kahneman, Knetsch and Thaler (1986a) gave subjects a choice between an \$18-\$2 split and a \$10-\$10 split of \$20 between themselves and an anonymous other person. There was no opportunity for rejection, so people bore no risk in asking for \$18 rather than \$10. Nonetheless, as noted earlier, 76% of subjects divided the money evenly. These results may be due to the limited range of choices given to subjects. Our results, and to some degree those of Binmore et al. (1989; 1991), present a more conservative conclusion, that players who have a high option and the right to exercise it use some but not all of their bargaining power.

Although our experiments created a pull toward game theory's equilibrium predictions, participants exhibited only minimal evidence that their demands were affected by considerations of fairness. While players with high outside options consistently demanded less than predicted, they demanded only slightly less, possibly to avoid rejection rather than to be fair. Players with poor outside options made demands that were often less than predicted but consistently more than 50-50. Players without outside options demanded either significantly more than predicted or more than 50-50. When player 2s could opt out for a high payoff, very few 50-50 splits were proposed by either player (5 out of 61 first demands, or 8.2% for player 1s; 2 of 74, or 2.7%, for player 2s). Thus, although 50-50 splits equalize outcomes and are a clear focal point, evidence for fairness (defined here and in previous demand game research as equal outcomes) is lacking in these games, as it was in Binmore et al. (1991). Alternatively, however, fairness might be less restrictively defined, even to the point of encompassing minimally acceptable offers. This, however, would mark a serious definitional change and would also reduce fairness's clear operational meaning.

These data make a strong case for Ochs and Roth's (1989) hypothesis that players focus on a minimally acceptable offer, both in making demands and in considering whether the other party will accept an offer. Thus, player 2s' demands when the equilibrium demand was very high (e.g., 97%) increased only slightly with experience, and never really approached the prediction. By conforming to the notion of "deal me out", player 2s could reap a large payoff while still making an offer that was acceptable to player 1s.

Similarly, player 1s' average offers never exceeded 75%, even when player 2s could opt out for 90%. Although the two players' perceptions of what constituted a minimally acceptable offer may have differed, neither pushed their proposals to the extremes of the equilibrium predictions. Both acted as if minimally acceptable offers were an appropriate basis for their bargaining demands.

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Footnotes

1. See, for example, Binmore, Shaked, and Sutton (1985, 1988, 1989); Binmore, Morgan, Shaked, and Sutton (1991); Guth and Tietz (1988, 1990); Hoffman and Spitzer (1982, 1985); Neelin, Sonnenschein, and Spiegel (1988); Ochs and Roth (1989); Kahneman, Knetsch, and Thaler (1986a,b); Thaler (1988); Rapoport, Weg, and Felsenthal (1990); and Weg, Rapoport, and Felsenthal (1990).

2. Equations 8 and 9 are based on equations 6 and 7, simulated at the seventh session.

3. While these effects for player 2s are not significantly different from zero (shift term) and one (effect of EQ) individually, the joint hypothesis of zero shift term and EQ term of one (assuming that they are in the seventh session) was rejected [$F(2,501)=28.909$, $p<.001$]. Nonetheless, the results in equation 5) are qualitatively very close to zero and one, respectively.

4. Explanatory variables in this analysis included session number and dummy variables for d, p, and option size categories and whether the first mover had the option.

5. Cases in which player 2 started the negotiations by opting out were omitted in the player 2 regressions.

6. Note that when player 2 had the right to opt out, $s = .9$, $p=.05$, and $d=.8$, accepted player 2 demands averaged .721. This is based on the 5 cases of agreement in these conditions (i.e. player 2s opted out the other times); three of the seven total disadvantageous offers were made in this condition.

Table 1: DESIGN AND EQUILIBRIUM PREDICTIONS FOR FIRST OFFERS

PROB(TERMINATION)/ DISCOUNT RATE		PLAYER 2s CANNOT OPT OUT 10% OPTION	PLAYER 2s CANNOT OPT OUT 90% OPTION	PLAYER 2s FREE TO OPT OUT 10% OPTION	PLAYER 2s FREE TO OPT OUT 90% OPTION
.05 / 1	PLAYER 1s' DEMANDS	.46-.54	.05-.95	.46-.54	.05-.95
	PLAYER 2s' DEMANDS	.44-.56	.05-.95	.44-.56	.05-.95
.05 / .8	PLAYER 1s' DEMANDS	.56-.44	.46-.54	.56-.44	.10-.90
	PLAYER 2s' DEMANDS	.42-.58	.35-.65	.42-.58	.08-.92
.50 / 1	PLAYER 1s' DEMANDS	.60-.40	.07-.93	.60-.40	.07-.93
	PLAYER 2s' DEMANDS	.30-.70	.03-.97	.30-.70	.03-.97
.50 / .8	PLAYER 1s' DEMANDS	.65-.35	.18-.82	.65-.35	.10-.90
	PLAYER 2s' DEMANDS	.26-.74	.07-.93	.26-.74	.04-.96

Note: Each paired entry is the predicted proportion of the payoff for player 1 followed by the predicted proportion of the payoff for player 2.

Table 2: MEAN OPENING OFFERS

PROB(TERMINATION)/ DISCOUNT RATE		PLAYER 2s: CANNOT OPT OUT, 10% OPTION	PLAYER 2s: CANNOT OPT OUT, 90% OPTION	PLAYER 2s: FREE TO OPT OUT, 10% OPTION	PLAYER 2s: FREE TO OPT OUT, 90% OPTION
.05 / 1	PLAYER 1s' DEMANDS	.65-.35	.62-.38	.62-.38	.25-.75
	(prediction)	(.46-.54)	(.05-.95)	(.46-.54)	(.05-.95)
	PLAYER 2s' DEMANDS	.35-.65	.15-.85	.44-.56*	.08-.92
	(prediction)	(.44-.56)	(.05-.95)	(.44-.56)	(.05-.95)
.05 / .8	PLAYER 1s' DEMANDS	.55-.45*	.51-.49*	.63-.37	.25-.75
	(prediction)	(.56-.44)	(.46-.54)	(.56-.44)	(.10-.90)
	PLAYER 2s' DEMANDS	.43-.57*	.43-.57	.43-.57*	.16-.84
	(prediction)	(.42-.58)	(.35-.65)	(.42-.58)	(.08-.92)
.50 / 1	PLAYER 1s' DEMANDS	.63-.37*	.48-.52	.64-.36*	.30-.70
	(prediction)	(.60-.40)	(.07-.93)	(.60-.40)	(.07-.93)
	PLAYER 2s' DEMANDS	.47-.53	.19-.81	.44-.56	.07-.93
	(prediction)	(.30-.70)	(.03-.97)	(.30-.70)	(.03-.97)
.50 / .8	PLAYER 1s' DEMANDS	.59-.41*	.49-.51	.61-.39*	.29-.71
	(prediction)	(.65-.35)	(.18-.82)	(.65-.35)	(.10-.90)
	PLAYER 2s' DEMANDS	.41-.59	.15-.85	.38-.62	.09-.91
	(prediction)	(.26-.74)	(.07-.93)	(.26-.74)	(.04-.96)

Note: Each paired entry is the mean proportion of the payoff for player 1s followed by the mean proportion of the payoff for player 2s. N's ranged from 10 to 21 in each cell. *'d entries are <u>not</u> significantly different from the prediction ($p < .05$).

Table 3: MEANS OF DEVIATIONS FROM PREDICTED FIRST ROUND DEMANDS FOR SIGNIFICANT FOUR-WAY INTERACTION

		Player 1		Player 2	
		10% OPTION	90% OPTION	10% OPTION	90% OPTION
Player 2 Is Free to Opt Out	d=1	.104** (.024)	.214** (.042)	-.070** (.020)	-.037** (.005)
	d=.8	.022 (.020)	.175** (.037)	-.061* (.023)	-.080** (.017)
Player 2 Cannot Opt Out	d=1	.089** (.029)	.470** (.033)	-.077* (.030)	-.137** (.030)
	d=.8	-.033 (.020)	.167** (.043)	-.074** (.024)	-.068** (.018)
	Mean	.045** (.012)	.251** (.022)	-.070** (.012)	-.076** (.010)

* Significantly different from zero, p < .05

** Significantly different from zero, p < .01

Note: Standard errors are shown in parentheses.

Table 4: EFFECTS OF EXPERIENCE ON FIRST ROUND DEMANDS

	Ordinary Least Squares Coefficients	
Constant	0.303 (.019)	0.351 (.031)
EQ	0.605 (.035)	0.457 (.072)
PLAYER	-0.047 (.021)	-0.147 (.100)
SESSION	-0.003 (.002)	-0.005 (.005)
EQ*PLAYER	----	0.225 (.142)
EQ*SESSION	----	0.007 (.011)
PLAYER*SESSION	----	-0.027 (.015)
EQ*PLAYER*SESSION	----	0.028 (.021)
R-squared	0.497	0.527
n	509	509

	Player 1	Player 2
δ(DEMAND)/δ(SESSION) (at mean EQ)	-0.0009 (.0079)	-0.0127 (.0047)
δ^2(DEMAND)/δ(EQ)δ(SESSION)	0.0068 (.0114)	0.0345 (.0176)

F-test for interaction terms (Column 2): $F(4,505) = 7.487$, $p < .001$

DEMAND=share of total demanded by focal player on first round

SESSION=session number

Table 5 INCIDENCE OF OUTCOMES

PROB(TERMINATION)/ DISCOUNT RATE		PLAYER 2s' CANNOT OPT OUT 10% OPTION	PLAYER 2s' CANNOT OPT OUT 90% OPTION	PLAYER 2s' FREE TO OPT OUT 10% OPTION	PLAYER 2s' FREE TO OPT OUT 90% OPTION
.05 / 1	Agreements	53% (10/19)	85% (17/20)	94% (34/36)	65% (30/46)
	Breakdowns	47% (9/19)	15% (3/20)	6% (2/36)	9% (4/46)
	Opt Outs	---	---	0% (0/36)	26% (12/46)
.05 / .8	Agreements	97% (29/30)	100% (30/30)	100% (40/40)	44% (14/32)
	Breakdowns	03% (1/30)	0% (0/30)	0% (0/40)	0% (0/32)
	Opt Outs	---	---	0% (0/40)	56% (18/32)
.50 / 1	Agreements	83% (30/36)	39% (14/36)	91% (29/32)	59% (19/32)
	Breakdowns	17% (6/36)	61% (22/36)	9% (3/32)	28% (9/32)
	Opt Outs	---	---	0% (0/32)	12% (4/32)
.50 / .8	Agreements	75% (21/28)	36% (10/28)	83% (29/35)	41% (11/27)
	Breakdowns	25% (7/28)	64% (18/28)	14% (5/35)	0% (0/27)
	Opt Outs	---	---	3% (1/35)	59% (16/27)
Mean	Agreements	71.9%		74.7%	
	Breakdowns	29.1%		8.2%	
	Opt Outs	----		18.2%	

Note: Bargaining pairs are the unit of analysis; frequencies are shown in parentheses.

Table 6: THE FREQUENCY AND PERCENTAGE OF OPENING 50-50 OFFERS

PROB(TERMINATION)/ DISCOUNT RATE		PLAYER 2s' CANNOT OPT OUT 10% OPTION	PLAYER 2s' CANNOT OPT OUT 90% OPTION	PLAYER 2s' FREE TO OPT OUT 10% OPTION	PLAYER 2s' FREE TO OPT OUT 90% OPTION
.05 / 1	PLAYER 1 DEMANDS	20% (2/10)	40% (4/10)	45% (9/20)	0% (0/16)
	PLAYER 2 DEMANDS	30% (3/10)	10% (1/10)	56% (9/16)	0% (0/30)
.05 / .8	PLAYER 1 DEMANDS	60% (9/15)	60% (9/15)	29% (7/24)	13% (2/15)
	PLAYER 2 DEMANDS	20% (3/15)	27% (4/15)	50% (8/16)	13% (2/15)
.50 / 1	PLAYER 1 DEMANDS	39% (7/18)	39% (7/18)	38% (6/16)	6% (1/16)
	PLAYER 2 DEMANDS	72% (13/18)	0% (0/18)	63% (10/16)	0% (0/16)
.50 / .8	PLAYER 1 DEMANDS	36% (5/14)	21% (3/14)	24% (5/21)	14% (2/14)
	PLAYER 2 DEMANDS	36% (5/14)	0% (0/14)	21% (3/14)	0% (0/13)

Note: Frequencies are shown in parentheses.

Table 7: MEAN VALUES FOR ACCEPTED OFFERS* (ALL ROUNDS)

PROB(TERMINATION)/ DISCOUNT RATE		PLAYER 2s: CANNOT OPT OUT 10% OPTION	PLAYER 2s: CANNOT OPT OUT 90% OPTION	PLAYER 2s: FREE TO OPT OUT 10% OPTION	PLAYER 2s: FREE TO OPT OUT 90% OPTION
.05 / 1	PLAYER 1 DEMANDS	.50-.50	.49-.51	.50-.50	.10-.90
	PLAYER 2 DEMANDS	.48-.52	.33-.67	.50-.50	.11-.89
.05 / .8	PLAYER 1 DEMANDS	.51-.49	.49-.51	.53-.47	.10-.90
	PLAYER 2 DEMANDS	.46-.54	.45-.55	.49-.51	.28-.72
.50 / 1	PLAYER 1 DEMANDS	.55-.45	.27-.73	.54-.46	.09-.91
	PLAYER 2 DEMANDS	.49-.51	.27-.73	.46-.54	.08-.92
.50 / .8	PLAYER 1 DEMANDS	.57-.43	.26-.74	.54-.46	.09-.91
	PLAYER 2 DEMANDS	.44-.56	.21-.79	.43-.57	.09-.91

Appendix: Derivation of Subgame Perfect Equilibrium Predictions for Experimental Conditions

This Appendix, which draws from Binmore, Shaked and Sutton (1989) and Binmore, Rubinstein and Wolinsky (1986), computes the unique subgame perfect equilibrium points for our experimental conditions. We assume an infinite horizon, in line with the fact that our game does not have a deterministic endpoint.

Player 2 Can Opt Out

Assume that Player 2 has an outside option, equal to a share s of the total to be divided. The option will be paid to him/her in the event of breakdown. Suppose also that Player 2 can opt out and collect s. In the event of breakdown or opting out by Player 2, Player 1 receives nothing. Let the discount factor be d and the breakdown probability in the event of a rejected offer be p. Let the size of the amount to be divided be 1.

Then let m_1 and M_1 be, respectively, the greatest lower bound and the least upper bound for Player 1's equilibrium payoffs, when Player 1 moves first. Let m_2 and M_2 be the corresponding values for Player 2 when Player 2 moves first.

Then we have:

a1) $m_1 \geq 1 - \max\{d(1-p)M_2 + ps, s\}$

a2) $1 - M_1 \geq \max\{(1-p)dm_2 + ps, s\}$

a3) $m_2 \geq 1-d(1-p)M_1$

a4) $1 - M_2 \geq d(1-p)m_1$.

Inequality a1) holds since in equilibrium, Player 2 will accept any offer greater than the expression in brackets. On the other hand, Player 2 must get at least what it is in brackets in a2). Inequalities a3) and a4) hold by reversing the order of the first offer.

We distinquish two cases: i) $s <$ or $= d(1-p)M_2 + ps$, and ii) $s >$ or $= d(1-p)M_2 + ps$. Taking case i), we have, using a1-a4):

$m_1 >$ or $= (1-d+p(d-s))/(1-d^2(1-p)^2)$, and

$M_1 <$ or $= (1-d+p(d-s))/(1-d^2(1-p)^2)$.

Therefore, $m_1 = M_1 =$

$(1-d+p(d-s))/(1-d^2(1-p)^2)$. Using similar reasoning, we have for Player 2:

$m_2 = M_2 = (1-d(1-p)(1-ps))/(1-d^2(1-p)^2)$.

Using this expression for M_2, we have the following threshold for s: case i) occurs when

$s <$ or $= (d-d^2+pd^2)/(1-d^2+pd^2)$.

Turning to case ii), we have:

$s >$ or $= (d-d^2+pd^2)/(1-d^2+pd^2)$. In this case, the outside option binds, and we have:

$m_1 = M_1 = 1-s$, and

$m_2 = M_2 = 1-d(1-p)(1-s)$.

A special case of this game occurs when $d = 1$--there is no discounting. In this case, the threshold for s is 1; whenever Player 2's outside option is less than the whole amount to be divided, the option does not bind. However, as can be seen from the above results, it still affects the equilibrium through the exogenous breakdown probability.

Neither Player Can Opt Out

When neither player can opt out, conditions a1) and a2) must be altered:

a1') $m_1 >$ or $= 1 - d(1-p)M_2 - ps$, and

a2') $1-M_1 <$ or $= (1-p)dm_2 + ps$.

Inequalities a1') and a2') remove the possibility of opting out. The solutions for Player 1's and Player 2's payoffs in this case are identical to those when Player 2 can opt out but when the outside option is not binding. This fact proves our assertion that when s doesn't bind (in the case where Player 2 can opt out), having the right to opt out makes no difference. Since s never binds when d = 1 (see above), having the right to opt out has no effect with this discount factor. This is the basis for our equality restrictions for the d = 1 case.

Appendix: Raw Data

I. Parameters: d=1, p= .05, neither player can opt out

Option	Session	Round	Mover Option (1=yes)	Pie Size	Mover Demand (-1=opt out)	Response (1=agree 2=reject 3=opt out 4=mover opted out)	Session Ends (1= yes)
100	1	1	0	1000	600	2	0
100	.1	2	1	1000	510	2	0
100	1	3	0	1000	500	1	1
100	1	1	0	1000	1000	2	0
100	1	2	1	1000	750	2	0
100	1	3	0	1000	500	1	1
100	1	1	0	1000	500	2	0
100	1	2	1	1000	1000	2	0
100	1	3	0	1000	500	2	0
100	1	4	1	1000	500	2	0
100	1	5	0	1000	1000	2	0
100	1	6	1	1000	600	1	1
100	1	1	0	1000	500	1	1
100	2	1	1	1000	500	1	1
100	2	1	1	1000	700	2	0
100	2	2	0	1000	600	2	0
100	2	3	1	1000	700	2	0
100	2	4	0	1000	600	2	0
100	2	5	1	1000	700	2	0
100	2	6	0	1000	550	2	0
100	2	7	1	1000	650	2	1
100	2	1	1	1000	750	2	0
100	2	2	0	1000	500	2	0
100	2	3	1	1000	599	2	0
100	2	4	0	1000	500	2	0
100	2	5	1	1000	550	2	0
100	2	6	0	1000	500	2	0
100	2	7	1	1000	501	2	1
100	2	1	1	1000	1000	2	0
100	2	2	0	1000	500	2	0
100	2	3	1	1000	999	2	0
100	2	4	0	1000	500	2	0
100	2	5	1	1000	800	2	0
100	2	6	0	1000	500	2	0
100	2	7	1	1000	700	2	1
900	3	1	0	1000	650	2	0
900	3	2	1	1000	1000	2	0
900	3	3	0	1000	900	2	0
900	3	4	1	1000	750	2	0
900	3	5	0	1000	550	2	0
900	3	6	1	1000	600	2	0
900	3	7	0	1000	501	1	1
900	3	1	0	1000	950	2	0
900	3	2	1	1000	700	2	0
900	3	3	0	1000	900	2	0
900	3	4	1	1000	650	2	0

900	3	5	0	1000	600	2	0
900	3	6	1	1000	500	2	0
900	3	7	0	1000	550	2	0
900	3	8	1	1000	500	2	0
900	3	9	0	1000	510	1	1
900	3	1	0	1000	500	1	1
900	3	1	0	1000	500	2	0
900	3	2	1	1000	1000	2	0
900	3	3	0	1000	300	2	0
900	3	4	1	1000	900	2	0
900	3	5	0	1000	600	2	0
900	3	6	1	1000	800	2	0
900	3	7	0	1000	400	1	1
900	4	1	1	1000	1000	2	0
900	4	2	0	1000	550	2	0
900	4	3	1	1000	990	2	0
900	4	4	0	1000	501	2	0
900	4	5	1	1000	980	2	0
900	4	6	0	1000	500	2	0
900	4	7	1	1000	925	2	0
900	4	8	0	1000	500	2	0
900	4	9	1	1000	910	2	0
900	4	10	0	1000	500	2	0
900	4	11	1	1000	900	2	0
900	4	12	0	1000	499	2	0
900	4	13	1	1000	890	2	0
900	4	14	0	1000	450	2	0
900	4	15	1	1000	875	2	0
900	4	16	0	1000	400	2	1
900	4	1	1	1000	1000	2	0
900	4	2	0	1000	700	2	0
900	4	3	1	1000	600	2	0
900	4	4	0	1000	600	2	0
900	4	5	1	1000	550	2	0
900	4	6	0	1000	500	1	1
900	4	1	1	1000	900	2	0
900	4	2	0	1000	500	2	0
900	4	3	1	1000	700	2	0
900	4	4	0	1000	500	2	0
900	4	5	1	1000	650	2	0
900	4	6	0	1000	500	2	0
900	4	7	1	1000	600	2	0
900	4	8	0	1000	500	2	0
900	4	9	1	1000	550	2	0
900	4	10	0	1000	500	2	0
900	4	11	1	1000	510	2	0
900	4	12	0	1000	500	1	1
900	4	1	1	1000	1000	2	0
900	4	2	0	1000	700	2	0
900	4	3	1	1000	1000	2	0
900	4	4	0	1000	1000	2	0
900	4	5	1	1000	1000	2	0
900	4	6	0	1000	500	2	0
900	4	7	1	1000	1000	2	0
900	4	8	0	1000	1000	2	0
900	4	9	1	1000	500	1	1
100	1	1	0	1000	600	2	1

100	1	1	0	1000	700	2	1
100	1	1	0	1000	700	2	1
100	1	1	0	1000	700	2	1
100	1	1	0	1000	600	2	1
100	1	1	0	1000	600	2	1
100	2	1	1	1000	600	2	0
100	2	2	0	1000	500	1	1
100	2	1	1	1000	600	2	0
100	2	2	0	1000	700	2	0
100	2	3	1	1000	550	2	0
100	2	4	0	1000	600	2	0
100	2	5	1	1000	525	2	0
100	.2	6	0	1000	500	1	1
100	2	1	1	1000	700	2	0
100	2	2	0	1000	500	1	1
100	2	1	1	1000	500	2	0
100	2	2	0	1000	600	2	0
100	2	3	1	1000	500	1	1
100	2	1	1	1000	500	1	1
100	2	1	1	1000	600	2	0
100	2	2	1	1000	500	1	1
900	3	1	0	1000	600	2	0
900	3	2	1	1000	600	2	0
900	3	3	0	1000	500	2	0
900	3	4	1	1000	500	1	1
900	3	1	0	1000	800	2	0
900	3	2	1	1000	500	1	1
900	3	1	0	1000	600	2	0
900	3	2	1	1000	950	2	0
900	3	3	0	1000	525	2	0
900	3	4	1	1000	900	1	1
900	3	1	0	1000	500	2	0
900	3	2	1	1000	950	2	0
900	3	3	0	1000	500	2	0
900	3	4	1	1000	925	2	0
900	3	5	0	1000	500	2	0
900	3	6	1	1000	925	2	0
900	3	7	0	1000	400	2	0
900	3	8	1	1000	900	1	1
900	3	1	0	1000	500	2	0
900	3	2	1	1000	900	2	0
900	3	3	0	1000	500	2	0
900	3	4	1	1000	800	2	0
900	3	5	0	1000	500	2	0
900	3	6	1	1000	750	2	0
900	3	7	0	1000	500	2	0
900	3	8	1	1000	800	2	0
900	3	9	0	1000	500	2	0
900	3	10	1	1000	700	2	0
900	3	11	0	1000	500	2	0
900	3	12	1	1000	700	2	0
900	3	13	0	1000	500	2	0
900	3	14	1	1000	650	2	0
900	3	15	0	1000	500	2	0
900	3	16	1	1000	650	2	1
900	3	1	0	1000	600	2	0
900	3	2	1	1000	700	2	0

900	3	3	0	1000	500	1	1
900	4	1	1	1000	600	2	0
900	4	2	0	1000	600	2	0
900	4	3	1	1000	600	2	0
900	4	4	0	1000	700	2	0
900	4	5	1	1000	700	2	0
900	4	6	0	1000	500	1	1
900	4	1	1	1000	700	2	0
900	4	2	0	1000	600	2	0
900	4	3	1	1000	600	2	0
900	4	4	0	1000	550	2	0
900	4	5	1	1000	600	2	0
900	4	6	0	1000	700	2	0
900	4	7	1	1000	550	2	0
900	4	8	0	1000	500	2	0
900	4	9	1	1000	525	2	0
900	4	10	0	1000	499	1	1
900	4	1	1	1000	500	1	1
900	4	1	1	1000	975	2	0
900	4	2	0	1000	700	2	0
900	4	3	1	1000	950	2	0
900	4	4	0	1000	500	2	0
900	4	5	1	1000	925	2	0
900	4	6	0	1000	400	2	0
900	4	7	1	1000	900	2	0
900	4	8	0	1000	400	2	0
900	4	9	1	1000	875	1	1
900	4	1	1	1000	950	2	0
900	4	2	0	1000	500	2	0
900	4	3	1	1000	925	2	0
900	4	4	0	1000	500	2	0
900	4	5	1	1000	925	2	0
900	4	6	0	1000	500	2	0
900	4	7	1	1000	950	2	0
900	4	8	0	1000	500	2	0
900	4	9	1	1000	925	2	0
900	4	10	0	1000	500	2	0
900	4	11	1	1000	950	2	0
900	4	12	0	1000	500	2	0
900	4	13	1	1000	915	2	0
900	4	14	0	1000	500	2	1
900	4	1	1	1000	900	2	0
900	4	2	0	1000	600	2	0
900	4	3	1	1000	800	2	0
900	4	4	0	1000	500	2	0
900	4	5	1	1000	750	2	0
900	4	6	0	1000	450	2	0
900	4	7	1	1000	700	1	1

II. <u>Parameters: d=0.8, p=.05, neither player can opt out</u>

Option	Session	Round	Mover Option	Pie Size	Mover Demand	Response	Session Ends
100	1	1	0	1000	700	2	0
80	1	2	1	800	400	1	1
100	1	1	0	1000	800	2	0
80	1	2	1	800	600	2	0

64	1	3	0	640	320	1	1
100	1	1	0	1000	500	1	1
100	1	1	0	1000	500	1	1
100	1	1	0	1000	500	1	1
100	2	1	1	1000	500	1	1
100	2	1	1	1000	500	1	1
100	2	1	1	1000	700	2	0
80	2	2	0	800	400	1	1
100	2	1	1	1000	700	2	0
80	2	2	0	800	400	2	0
64	2	3	1	640	400	2	0
51	2	4	0	512	250	2	1
100	2	1	1	1000	600	1	1
900	3	1	0	1000	500	1	1
900	3	1	0	1000	500	2	0
720	3	2	1	800	500	2	0
576	3	3	0	640	320	1	1
900	3	1	0	1000	550	1	1
900	3	1	0	1000	700	2	0
720	3	2	1	800	400	1	1
900	3	1	0	1000	500	2	0
720	3	2	1	800	500	2	0
576	3	3	0	640	320	2	0
461	3	4	1	512	300	1	1
900	4	1	1	1000	600	2	0
720	4	2	0	800	400	2	0
576	4	3	1	640	400	2	0
461	4	4	0	512	212	1	1
900	4	1	1	1000	600	2	0
720	4	2	0	800	400	1	1
900	4	1	1	1000	600	2	0
720	4	2	0	800	450	2	0
576	4	3	1	640	320	1	1
900	4	1	1	1000	500	1	1
900	4	1	1	1000	600	1	1
900	5	1	0	1000	500	1	1
900	5	1	0	1000	500	1	1
900	5	1	0	1000	500	1	1
900	5	1	0	1000	400	1	1
900	5	1	0	1000	500	1	1
900	6	1	1	1000	500	1	1
900	6	1	1	1000	600	2	0
720	6	2	0	800	400	1	1
900	6	1	1	1000	600	2	0
720	6	2	0	800	410	2	0
576	6	3	1	640	350	1	1
900	6	1	1	1000	600	1	1
900	6	1	1	1000	600	1	1
100	7	1	0	1000	500	1	1
100	7	1	0	1000	500	1	1
100	7	1	0	1000	550	1	1
100	7	1	0	1000	500	1	1
100	7	1	0	1000	600	1	1
100	8	1	1	1000	600	2	0
80	8	2	0	800	400	1	1
100	8	1	1	1000	500	1	1
100	8	1	1	1000	550	1	1

100	8	1	1	1000	550	1	1
100	8	1	1	1000	550	1	1
100	9	1	0	1000	500	1	1
100	9	1	0	1000	500	1	1
100	9	1	0	1000	550	1	1
100	9	1	0	1000	500	1	1
100	9	1	0	1000	600	2	0
80	9	2	1	800	400	1	1
100	10	1	1	1000	550	1	1
100	10	1	1	1000	550	1	1
100	10	1	1	1000	600	1	1
100	10	1	1	1000	600	1	1
100	10	1	1	1000	525	1	1
900	11	1	0	1000	500	1	1
900	11	1	0	1000	550	1	1
900	11	1	0	1000	500	2	0
720	11	2	1	800	600	2	0
576	11	3	0	640	320	2	0
461	11	4	1	512	300	1	1
900	11	1	0	1000	400	1	1
900	11	1	0	1000	600	1	1
900	12	1	1	1000	625	2	0
720	12	2	0	800	400	1	1
900	12	1	1	1000	500	2	0
720	12	2	0	800	400	1	1
900	12	1	1	1000	550	1	1
900	12	1	1	1000	575	1	1
900	12	1	1	1000	500	1	1

III. Parameters: d=1, p=.05, Player 2 can opt out

Option	Session	Round	Mover Option	Pie Size	Mover Demand	Response	Session Ends
100	1	1	0	1000	500	1	1
100	1	1	0	1000	800	2	0
100	1	2	1	1000	600	2	0
100	1	3	0	1000	500	1	1
100	1	1	0	1000	700	2	0
100	1	2	1	1000	600	2	0
100	1	3	0	1000	500	2	0
100	1	4	1	1000	575	2	0
100	1	5	0	1000	500	2	0
100	1	6	1	1000	525	2	1
100	1	1	0	1000	500	1	1
100	2	1	1	1000	650	2	0
100	2	2	0	1000	600	2	0
100	2	3	1	1000	500	1	1
100	2	1	1	1000	600	2	0
100	2	2	0	1000	500	2	0
100	2	3	1	1000	550	2	0
100	2	4	0	1000	500	2	0
100	2	5	1	1000	550	1	1
100	2	1	1	1000	600	2	0
100	2	2	0	1000	500	2	0
100	2	3	1	1000	600	2	0
100	2	4	0	1000	525	2	0
100	2	5	1	1000	600	2	0

100	2	6	0	1000	500	2	0
100	2	7	1	1000	600	2	0
100	2	8	0	1000	525	2	0
100	2	9	1	1000	550	2	0
100	2	10	0	1000	500	1	1
100	2	1	1	1000	700	2	0
100	2	2	0	1000	600	2	0
100	2	3	1	1000	550	2	0
100	2	4	0	1000	500	1	1
900	3	1	0	1000	300	2	0
900	3	2	1	1000	950	2	0
900	3	3	0	1000	250	2	0
900	3	4	1	1000	910	2	0
900	3	5	0	1000	200	2	0
900	3	6	1	1000	905	2	1
900	3	1	0	1000	100	2	0
900	3	2	1	1000	950	2	0
900	3	3	0	1000	100	2	0
900	3	4	1	1000	925	2	0
900	3	5	0	1000	100	3	1
900	3	1	0	1000	300	2	0
900	3	2	1	1000	950	2	0
900	3	3	0	1000	250	2	0
900	3	4	1	1000	925	2	0
900	3	5	0	1000	200	2	0
900	3	6	1	1000	925	2	1
900	3	1	0	1000	100	2	0
900	3	2	1	1000	950	2	0
900	3	3	0	1000	95	1	1
900	4	1	1	1000	950	2	0
900	4	2	0	1000	103	2	1
900	4	1	1	1000	950	2	0
900	4	2	0	1000	99	1	1
900	4	1	1	1000	950	2	0
900	4	2	0	1000	200	3	1
900	4	1	1	1000	975	2	0
900	4	2	0	1000	100	1	1
900	5	1	0	1000	99	1	1
900	5	1	0	1000	100	2	0
900	5	2	1	1000	950	2	0
900	5	3	0	1000	95	2	0
900	5	4	1	1000	940	2	1
900	5	1	0	1000	125	2	0
900	5	2	1	1000	950	2	0
900	5	3	0	1000	100	2	0
900	5	4	1	1000	925	1	1
900	5	1	0	1000	100	2	0
900	5	2	1	1000	950	2	0
900	5	3	0	1000	95	2	0
900	5	4	1	1000	925	1	1
900	6	1	1	1000	950	2	0
900	6	2	0	1000	100	2	0
900	6	3	1	1000	925	2	0
900	6	4	0	1000	90	2	0
900	6	5	1	1000	920	1	1
900	6	1	1	1000	950	2	0
900	6	2	0	1000	75	1	1

900	6	1	1	1000	950	2	0
900	6	2	0	1000	125	2	0
900	6	3	1	1000	950	2	0
900	6	4	0	1000	100	2	0
900	6	5	1	1000	940	2	0
900	6	6	0	1000	80	1	1
900	6	1	1	1000	950	2	0
900	6	2	0	1000	10	1	1
100	7	1	0	1000	600	2	0
100	7	2	1	1000	575	2	0
100	7	3	0	1000	550	2	0
100	7	4	1	1000	570	2	0
100	7	5	0	1000	500	1	1
100	7	1	0	1000	500	1	1
100	7	1	0	1000	600	2	0
100	7	2	1	1000	700	2	0
100	7	3	0	1000	500	2	0
100	7	4	1	1000	600	2	0
100	7	5	0	1000	525	2	0
100	7	6	1	1000	525	2	0
100	7	7	0	1000	500	1	1
100	7	1	0	1000	600	2	0
100	7	2	1	1000	550	2	0
100	7	3	0	1000	500	2	0
100	7	4	1	1000	530	2	0
100	7	5	0	1000	500	2	0
100	7	6	1	1000	530	2	0
100	7	7	0	1000	495	1	1
100	1	1	0	1000	700	2	0
100	1	2	1	1000	500	1	1
100	1	1	0	1000	800	2	0
100	1	2	1	1000	500	1	1
100	1	1	0	1000	500	1	1
100	2	1	1	1000	500	1	1
100	2	1	1	1000	600	2	0
100	2	2	0	1000	500	1	1
100	2	1	1	1000	700	2	0
100	2	2	0	1000	500	1	1
900	3	1	0	1000	100	1	1
900	3	1	0	1000	700	3	1
900	3	1	0	1000	400	2	0
900	3	2	1	1000	950	2	0
900	3	3	0	1000	200	3	1
900	4	1	1	1000	800	1	1
900	4	1	1	1000	900	1	1
900	4	1	1	1000	925	2	0
900	4	2	0	1000	150	3	1
900	5	1	0	1000	100	1	1
900	5	1	0	1000	100	1	1
900	5	1	0	1000	150	1	1
900	6	1	1	1000	900	1	1
900	6	1	1	1000	-1	4	1
900	6	1	1	1000	900	1	1
100	7	1	0	1000	800	2	0
100	7	2	1	1000	500	1	1
100	7	1	0	1000	900	2	0
100	7	2	1	1000	900	2	0

100	7	3	0	1000	850	2	1
100	7	1	0	1000	500	1	1
100	8	1	1	1000	500	1	1
100	8	1	1	1000	500	2	0
100	8	2	0	1000	750	2	0
100	8	3	1	1000	1000	2	0
100	8	4	0	1000	501	2	0
100	8	5	1	1000	500	1	1
100	8	1	1	1000	500	1	1
100	9	1	0	1000	500	1	1
100	9	1	0	1000	667	2	0
100	9	2	1	1000	400	1	1
100	9	1	0	1000	500	1	1
100	10	1	1	1000	500	1	1
100	10	1	1	1000	500	1	1
100	10	1	1	1000	600	2	0
100	10	2	0	1000	500	1	1
900	11	1	0	1000	200	3	1
900	11	1	0	1000	150	2	0
900	11	2	1	1000	900	1	1
900	11	1	0	1000	200	1	1
900	12	1	1	1000	900	1	1
900	12	1	1	1000	-1	4	1
900	12	1	1	1000	900	1	1
100	13	1	0	1000	500	1	1
100	13	1	0	1000	650	2	0
100	13	2	1	1000	500	1	1
100	13	1	0	1000	500	1	1
100	14	1	1	1000	500	1	1
100	14	1	1	1000	500	1	1
100	14	1	1	1000	500	1	1
900	15	1	0	1000	100	1	1
900	15	1	0	1000	1000	3	1
900	15	1	0	1000	150	2	0
900	15	2	1	1000	900	1	1
900	16	1	1	1000	900	1	1
900	16	1	1	1000	900	1	1
900	16	1	1	1000	-1	4	1
900	17	1	0	1000	900	3	1
900	17	1	0	1000	99	2	0
900	17	2	1	1000	800	1	1
900	17	1	0	1000	150	1	1
900	18	1	1	1000	900	1	1
900	18	1	1	1000	-1	4	1
900	18	1	1	1000	900	1	1

IV. Parameters: d=0.8, p=.05, Player 2 can opt out

Option	Session	Round	Mover Option	Pie Size	Mover Demand	Response	Session Ends
100	1	1	0	1000	550	2	0
80	1	2	1	800	400	1	1
100	1	1	0	1000	600	1	1
100	1	1	0	1000	800	2	0
80	1	2	1	800	500	2	0
64	1	3	0	640	320	1	1
100	1	1	0	1000	880	2	0

80	1	2	1	800	500	2	0
64	1	3	0	640	320	1	1
100	1	1	0	1000	500	1	1
100	1	1	0	1000	600	1	1
100	1	1	0	1000	700	2	0
80	1	2	1	800	425	1	1
100	1	1	0	1000	800	2	0
80	1	2	1	800	500	2	0
64	1	3	0	640	500	2	0
51	1	4	1	512	500	2	0
41	1	5	0	410	300	1	1
100	2	1	1	1000	500	1	1
100	2	1	1	1000	550	1	1
100	2	1	1	1000	550	2	0
80	2	2	0	800	400	1	1
100	2	1	1	1000	700	2	0
80	2	2	0	800	400	1	1
100	2	1	1	1000	700	2	0
80	2	2	0	800	400	1	1
100	2	1	1	1000	500	1	1
100	2	1	1	1000	600	2	0
80	2	2	0	800	425	1	1
100	2	1	1	1000	900	2	0
80	2	2	0	800	600	2	0
64	2	3	1	640	340	1	1
900	3	1	0	1000	100	1	1
900	3	1	0	1000	100	1	1
900	3	1	0	1000	700	3	1
900	3	1	0	1000	99	1	1
900	3	1	0	1000	800	3	1
900	3	1	0	1000	500	3	1
900	3	1	0	1000	100	1	1
900	3	1	0	1000	100	1	1
900	4	1	1	1000	900	1	1
900	4	1	1	1000	805	1	1
900	4	1	1	1000	500	1	1
900	4	1	1	1000	-1	4	1
900	4	1	1	1000	-1	4	1
900	4	1	1	1000	-1	4	1
900	4	1	1	1000	-1	4	1
900	4	1	1	1000	-1	4	1
900	5	1	0	1000	100	1	1
900	5	1	0	1000	110	3	1
900	5	1	0	1000	500	3	1
900	5	1	0	1000	99	1	1
900	5	1	0	1000	175	3	1
900	5	1	0	1000	300	3	1
900	5	1	0	1000	100	1	1
900	5	1	0	1000	100	1	1
900	6	1	1	1000	-1	4	1
900	6	1	1	1000	-1	4	1
900	6	1	1	1000	900	2	0
720	6	2	0	800	400	3	1
900	6	1	1	1000	900	1	1
900	6	1	1	1000	500	1	1
900	6	1	1	1000	-1	4	1
900	6	1	1	1000	-1	4	1

900	6	1	1	1000	-1	4	1
100	7	1	0	1000	800	2	0
80	7	2	1	800	400	2	0
64	7	3	0	640	340	1	1
100	7	1	0	1000	700	2	0
80	7	2	1	800	400	1	1
100	7	1	0	1000	600	2	0
80	7	2	1	800	400	2	0
64	7	3	0	640	500	2	0
51	7	4	1	512	312	1	1
100	7	1	0	1000	600	2	0
80	7	2	1	800	425	2	0
64	7	3	0	640	320	1	1
100	7	1	0	1000	500	1	1
100	7	1	0	1000	600	1	1
100	7	1	0	1000	600	2	0
80	7	2	1	800	420	1	1
100	7	1	0	1000	700	2	0
80	7	2	1	800	400	1	1
100	8	1	1	1000	500	2	0
80	8	2	0	800	500	2	0
64	8	3	1	640	320	1	1
100	8	1	1	1000	500	1	1
100	8	1	1	1000	500	1	1
100	8	1	1	1000	600	2	0
80	8	2	0	800	400	1	1
100	8	1	1	1000	500	1	1
100	8	1	1	1000	500	1	1
100	8	1	1	1000	500	1	1
100	8	1	1	1000	450	2	0
80	8	2	0	800	700	2	0
64	8	3	1	640	320	1	1
100	9	1	0	1000	800	2	0
80	9	2	1	800	420	2	0
64	9	3	0	640	321	1	1
100	9	1	0	1000	500	1	1
100	9	1	0	1000	500	1	1
100	9	1	0	1000	500	1	1
100	9	1	0	1000	500	1	1
100	9	1	0	1000	600	2	0
80	9	2	1	800	400	1	1
100	9	1	0	1000	500	1	1
100	9	1	0	1000	800	2	0
80	9	2	1	800	400	1	1

V. <u>Parameters: d=1, p=.50, neither player can opt out</u>

Option	Session	Round	Mover Option	Pie Size	Mover Demand	Response	Session Ends
100	1	1	0	1000	500	1	1
100	1	1	0	1000	500	1	1
100	1	1	0	1000	800	2	1
100	1	1	0	1000	600	2	1
100	1	1	0	1000	500	1	1
100	1	1	0	1000	500	1	1
100	2	1	1	1000	700	2	1
100	2	1	1	1000	600	1	1

100	2	1	1	1000	600	1	1
100	2	1	1	1000	500	1	1
100	2	1	1	1000	500	1	1
100	2	1	1	1000	500	1	1
900	3	1	0	1000	500	2	0
900	3	2	1	1000	800	2	1
900	3	1	0	1000	700	2	0
900	3	2	1	1000	700	1	1
900	3	1	0	1000	600	2	0
900	3	2	1	1000	800	2	1
900	3	1	0	1000	500	1	1
900	3	1	0	1000	550	2	0
900	3	2	1	1000	1000	2	1
900	3	1	0	1000	500	2	0
900	3	2	1	1000	900	2	1
900	4	1	1	1000	800	2	0
900	4	2	0	1000	500	2	0
900	4	3	1	1000	700	1	1
900	4	1	1	1000	700	2	0
900	4	2	0	1000	650	2	0
900	4	3	1	1000	800	2	0
900	4	4	0	1000	550	2	1
900	4	1	1	1000	600	1	1
900	4	1	1	1000	1000	2	0
900	4	2	0	1000	700	2	0
900	4	3	1	1000	900	2	0
900	4	4	0	1000	500	2	1
900	4	1	1	1000	900	2	0
900	4	2	0	1000	200	2	0
900	4	3	1	1000	900	1	1
900	4	1	1	1000	800	1	1
900	5	1	0	1000	500	2	1
900	5	1	0	1000	650	2	1
900	5	1	0	1000	700	2	1
900	5	1	0	1000	600	2	1
900	5	1	0	1000	450	2	1
900	5	1	0	1000	200	2	1
900	6	1	1	1000	550	1	1
900	6	1	1	1000	1000	2	1
900	6	1	1	1000	900	1	1
900	6	1	1	1000	800	2	1
900	6	1	1	1000	900	2	1
900	6	1	1	1000	700	2	1
100	7	1	0	1000	500	1	1
100	7	1	0	1000	800	2	0
100	7	2	1	1000	500	2	0
100	7	3	0	1000	800	2	0
100	7	4	1	1000	500	2	0
100	7	5	0	1000	800	2	1
100	7	1	0	1000	800	2	0
100	7	2	1	1000	500	1	1
100	7	1	0	1000	800	1	1
100	7	1	0	1000	700	2	0
100	7	2	1	1000	500	1	1
100	7	1	0	1000	600	2	0
100	7	2	1	1000	550	1	1
100	8	1	1	1000	500	1	1

100	8	1	1	1000	500	1	1
100	8	1	1	1000	500	1	1
100	8	1	1	1000	500	1	1
100	8	1	1	1000	500	1	1
100	8	1	1	1000	500	1	1
100	9	1	0	1000	500	1	1
100	9	1	0	1000	800	2	0
100	9	2	1	1000	500	1	1
100	9	1	0	1000	600	2	0
100	9	2	1	1000	500	2	0
100	9	3	0	1000	600	2	1
100	9	1	0	1000	800	2	0
100	9	2	1	1000	450	1	1
100	9	1	0	1000	600	1	1
100	9	1	0	1000	500	1	1
100	10	1	1	1000	600	2	0
100	10	2	0	1000	500	1	1
100	10	1	1	1000	500	2	0
100	10	2	0	1000	800	2	1
100	10	1	1	1000	500	1	1
100	10	1	1	1000	600	2	0
100	10	2	0	1000	600	1	1
100	10	1	1	1000	500	1	1
100	10	1	1	1000	500	1	1
900	11	1	0	1000	500	2	1
900	11	1	0	1000	500	2	1
900	11	1	0	1000	400	2	1
900	11	1	0	1000	500	2	1
900	11	1	0	1000	200	1	1
900	11	1	0	1000	100	1	1
900	12	1	1	1000	550	1	1
900	12	1	1	1000	1000	2	0
900	12	2	0	1000	500	2	0
900	12	3	1	1000	1000	2	1
900	12	1	1	1000	950	2	0
900	12	2	0	1000	500	2	0
900	12	3	1	1000	925	2	1
900	12	1	1	1000	800	2	0
900	12	2	0	1000	300	1	1
900	12	1	1	1000	900	1	1
900	12	1	1	1000	700	1	1

VI. Parameters: d=0.8, p=.50, neither player can opt out

Option	Session	Round	Mover Option	Pie Size	Mover Demand	Response	Session Ends
100	1	1	0	1000	500	1	1
100	1	1	0	1000	640	1	1
100	1	1	0	1000	500	1	1
100	1	1	0	1000	500	2	1
100	1	1	0	1000	600	1	1
100	1	1	0	1000	400	1	1
100	1	1	0	1000	600	1	1
100	2	1	1	1000	500	1	1
100	2	1	1	1000	600	2	1
100	2	1	1	1000	510	1	1
100	2	1	1	1000	600	1	1

100	2	1	1	1000	1000	2	1
100	2	1	1	1000	800	1	1
100	2	1	1	1000	600	1	1
900	3	1	0	1000	600	2	1
900	3	1	0	1000	700	2	1
900	3	1	0	1000	450	2	1
900	3	1	0	1000	200	1	1
900	3	1	0	1000	500	2	1
900	3	1	0	1000	400	2	1
900	3	1	0	1000	600	2	1
900	4	1	1	1000	800	2	0
720	4	2	0	800	500	2	1
900	4	1	1	1000	900	1	1
900	4	1	1	1000	910	2	0
720	4	2	0	800	400	2	1
900	4	1	1	1000	600	2	0
720	4	2	0	800	500	2	1
900	4	1	1	1000	1000	2	0
720	4	2	0	800	75	1	1
900	4	1	1	1000	800	2	0
720	4	2	0	800	400	2	1
900	4	1	1	1000	700	1	1
900	5	1	0	1000	200	1	1
900	5	1	0	1000	600	2	1
900	5	1	0	1000	900	2	1
900	5	1	0	1000	500	1	1
900	5	1	0	1000	575	2	1
900	5	1	0	1000	85	1	1
900	5	1	0	1000	500	1	1
900	6	1	1	1000	800	2	1
900	6	1	1	1000	850	1	1
900	6	1	1	1000	910	2	1
900	6	1	1	1000	1000	2	1
900	6	1	1	1000	1000	2	1
900	6	1	1	1000	900	2	1
900	6	1	1	1000	700	1	1
100	7	1	0	1000	700	1	1
100	7	1	0	1000	500	1	1
100	7	1	0	1000	600	2	1
100	7	1	0	1000	900	2	1
100	7	1	0	1000	600	1	1
100	7	1	0	1000	500	1	1
100	7	1	0	1000	700	1	1
100	8	1	1	1000	500	2	1
100	8	1	1	1000	550	2	1
100	8	1	1	1000	510	1	1
100	8	1	1	1000	600	1	1
100	8	1	1	1000	500	1	1
100	8	1	1	1000	500	1	1
100	8	1	1	1000	500	1	1

VII. Parameters: d=1, p=.50, Player 2 can opt out

Option	Session	Round	Mover Option	Pie Size	Mover Demand	Response	Session Ends
100	1	1	0	1000	500	1	1
100	1	1	0	1000	500	1	1

100	1	1	0	1000	500	1	1
100	1	1	0	1000	500	1	1
100	1	1	0	1000	650	1	1
100	1	1	0	1000	500	1	1
100	1	1	0	1000	600	1	1
100	1	1	0	1000	600	1	1
100	2	1	1	1000	500	1	1
100	2	1	1	1000	500	1	1
100	2	1	1	1000	500	1	1
100	2	1	1	1000	500	1	1
100	2	1	1	1000	500	1	1
100	2	1	1	1000	500	1	1
100	2	1	1	1000	900	1	1
100	2	1	1	1000	700	2	0
100	2	2	0	1000	600	2	0
100	2	3	1	1000	600	1	1
900	3	1	0	1000	100	1	1
900	3	1	0	1000	400	3	1
900	3	1	0	1000	100	1	1
900	3	1	0	1000	300	3	1
900	3	1	0	1000	75	1	1
900	3	1	0	1000	500	2	1
900	3	1	0	1000	125	3	1
900	3	1	0	1000	300	2	1
900	4	1	1	1000	900	1	1
900	4	1	1	1000	900	1	1
900	4	1	1	1000	900	1	1
900	4	1	1	1000	900	1	1
900	4	1	1	1000	950	2	0
900	4	2	0	1000	200	2	1
900	4	1	1	1000	975	1	1
900	4	1	1	1000	975	2	0
900	4	2	0	1000	75	1	1
900	4	1	1	1000	950	2	0
900	4	2	0	1000	100	2	1
900	5	1	0	1000	100	1	1
900	5	1	0	1000	400	2	0
900	5	2	1	1000	900	1	1
900	5	1	0	1000	100	1	1
900	5	1	0	1000	400	3	1
900	5	1	0	1000	100	1	1
900	5	1	0	1000	900	2	0
900	5	2	1	1000	975	2	1
900	5	1	0	1000	75	2	0
900	5	2	1	1000	975	1	1
900	5	1	0	1000	900	2	0
900	5	2	1	1000	950	1	1
900	6	1	1	1000	900	1	1
900	6	1	1	1000	900	2	1
900	6	1	1	1000	900	1	1
900	6	1	1	1000	900	1	1
900	6	1	1	1000	925	2	1
900	6	1	1	1000	975	2	1
900	6	1	1	1000	930	2	1
900	6	1	1	1000	975	1	1
100	7	1	0	1000	500	1	1
100	7	1	0	1000	700	2	0

100	7	2	1	1000	500	1	1
100	7	1	0	1000	900	2	0
100	7	2	1	1000	500	1	1
100	7	1	0	1000	800	2	0
100	7	2	1	1000	700	1	1
100	7	1	0	1000	600	1	1
100	7	1	0	1000	800	2	0
100	7	2	1	1000	500	1	1
100	7	1	0	1000	800	2	0
100	7	2	1	1000	600	1	1
100	7	1	0	1000	800	2	0
100	7	2	1	1000	400	1	1
100	8	1	1	1000	500	1	1
100	8	1	1	1000	500	1	1
100	8	1	1	1000	500	1	1
100	8	1	1	1000	600	2	0
100	8	2	0	1000	900	2	1
100	8	1	1	1000	500	1	1
100	8	1	1	1000	600	2	0
100	8	2	0	1000	650	2	1
100	8	1	1	1000	600	2	0
100	8	2	0	1000	500	2	1
100	8	1	1	1000	600	2	0
100	8	2	0	1000	500	1	1

VIII. Parameters: d=0.8, p=.50, Player 2 can opt out

Option	Session	Round	Mover Option	Pie Size	Mover Demand	Response	Session Ends
100	1	1	0	1000	600	1	1
100	1	1	0	1000	600	2	0
80	1	2	1	800	400	1	1
100	1	1	0	1000	600	1	1
100	1	1	0	1000	800	2	0
80	1	2	1	800	400	1	1
100	1	1	0	1000	700	2	0
80	1	2	1	800	400	1	1
100	1	1	0	1000	500	1	1
100	1	1	0	1000	700	3	1
100	2	1	1	1000	600	1	1
100	2	1	1	1000	600	1	1
100	2	1	1	1000	550	1	1
100	2	1	1	1000	950	2	0
80	2	2	0	800	500	1	1
100	2	1	1	1000	600	1	1
100	2	1	1	1000	600	1	1
100	2	1	1	1000	500	1	1
900	3	1	0	1000	600	3	1
900	3	1	0	1000	280	3	1
900	3	1	0	1000	95	1	1
900	3	1	0	1000	75	1	1
900	3	1	0	1000	500	3	1
900	3	1	0	1000	500	3	1
900	3	1	0	1000	100	1	1
900	4	1	1	1000	-1	4	1
900	4	1	1	1000	-1	4	1
900	4	1	1	1000	-1	4	1

900	4	1	1	1000	-1	4	1
900	4	1	1	1000	950	2	0
900	4	1	1	1000	-1	4	1
900	4	1	1	1000	850	1	1
900	5	1	0	1000	700	3	1
900	5	1	0	1000	100	1	1
900	5	1	0	1000	95	1	1
900	5	1	0	1000	95	1	1
900	5	1	0	1000	200	3	1
900	5	1	0	1000	600	3	1
900	5	1	0	1000	100	1	1
900	6	1	1	1000	-1	4	1
900	6	1	1	1000	850	1	1
900	6	1	1	1000	-1	4	1
900	6	1	1	1000	975	1	1
900	6	1	1	1000	950	1	1
900	6	1	1	1000	-1	4	1
900	6	1	1	1000	-1	4	1
100	7	1	0	1000	875	2	0
80	7	2	1	800	400	2	0
64	7	3	0	640	600	2	0
51	7	4	1	512	256	2	0
41	7	5	0	410	350	2	1
100	7	1	0	1000	500	1	1
100	7	1	0	1000	600	1	1
100	7	1	0	1000	700	2	0
80	7	2	1	800	500	1	1
100	7	1	0	1000	500	1	1
100	7	1	0	1000	800	2	0
80	7	2	1	800	500	1	1
100	7	1	0	1000	600	1	1
100	8	1	1	1000	500	2	0
80	8	2	0	800	600	2	1
100	8	1	1	1000	500	1	1
100	8	1	1	1000	600	1	1
100	8	1	1	1000	600	1	1
100	8	1	1	1000	800	2	0
80	8	2	0	800	500	2	1
100	8	1	1	1000	600	1	1
100	8	1	1	1000	700	2	0
80	8	2	0	800	400	1	1
100	9	1	0	1000	600	2	1
100	9	1	0	1000	500	1	1
100	9	1	0	1000	600	1	1
100	9	1	0	1000	600	1	1
100	9	1	0	1000	500	1	1
100	9	1	0	1000	600	2	1
100	9	1	0	1000	400	1	1